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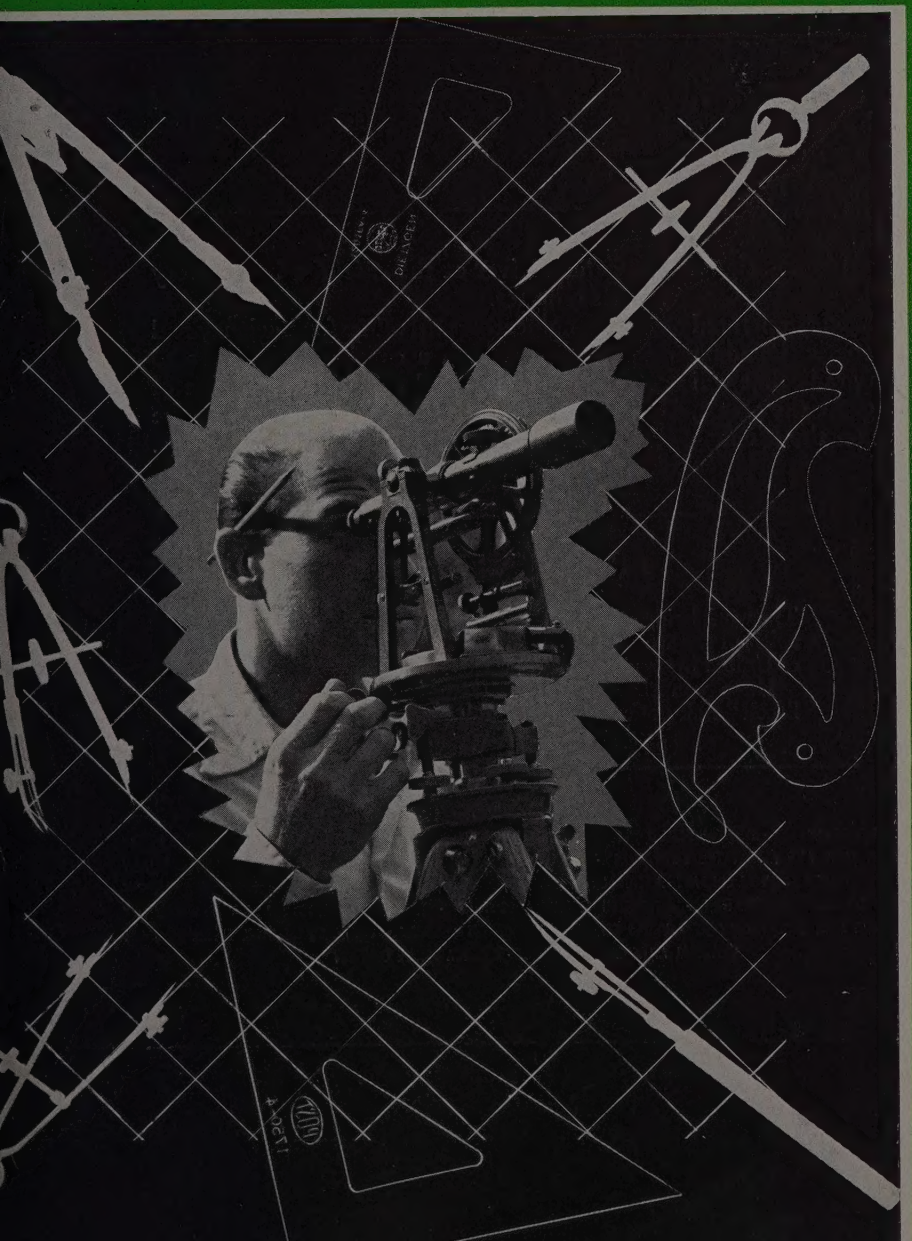

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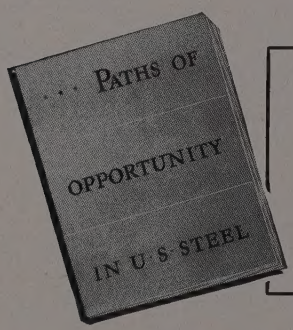

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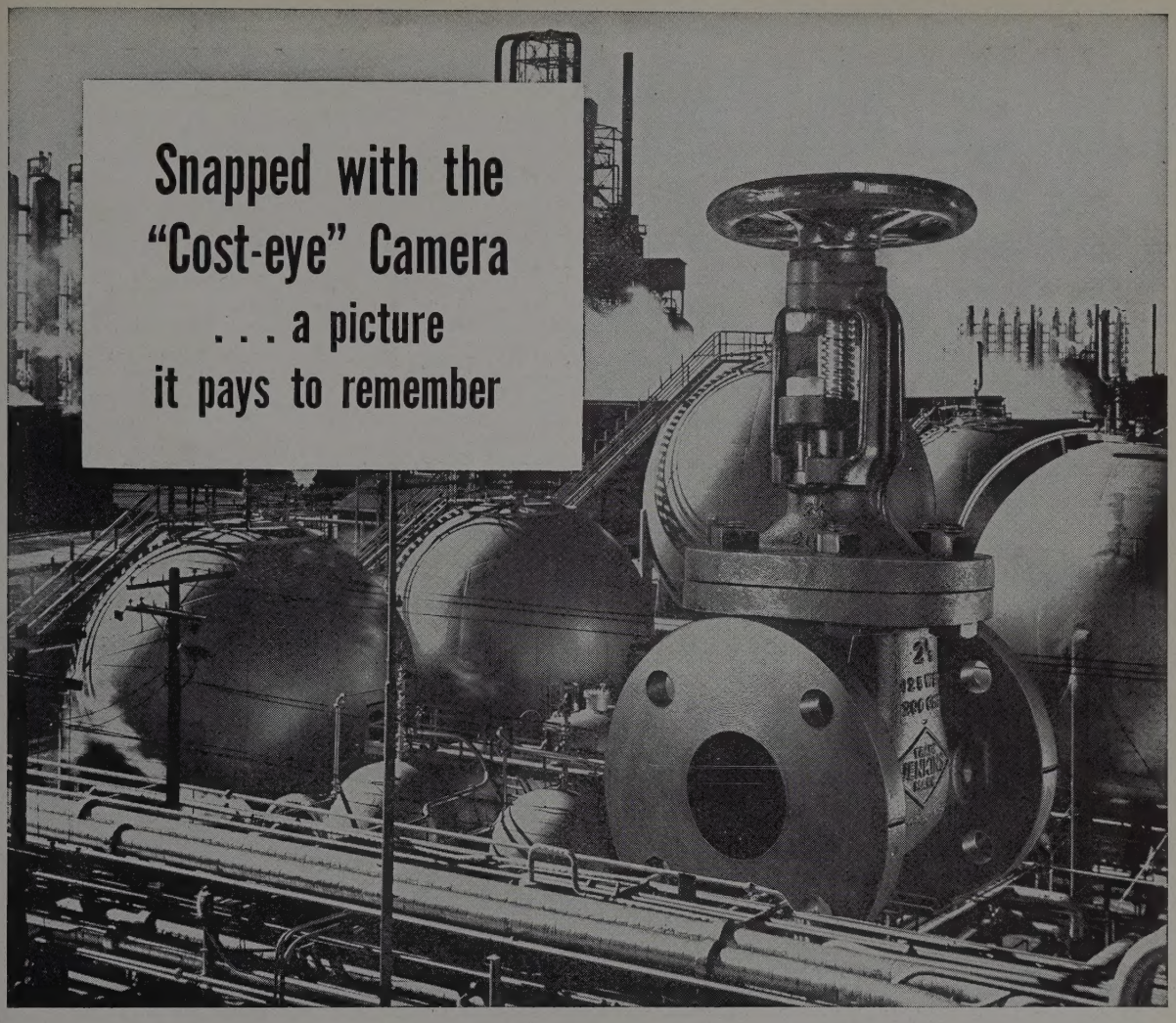

IF A CAMERA could be constructed with an eye to costs, this is the picture you'd get of a synthetic rubber plant. By showing *all valves* as *one valve* it brings into proper perspective the valve investment in *any* plant, *any* large building where operation involves fluid control. Collectively, valves represent a major expenditure . . . yet too often, they are selected with "petty cash" consideration.

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New Developments

By Leonard Ladof, E.E. '49
Ken McOwan, M.E. '49
Bill Shurtleff, E.E. '50
C. M. McClymonds, M.E. '49

Army Supersonic Wind Tunnel

The Army ordnance has perfected and built a supersonic wind tunnel laboratory at Aberdeen proving grounds, Maryland, which promises to propel related research into a speed which would seem supersonic in comparison to that carried on in previous years. The great advantage of the Aberdeen tunnel, as will be explained later, is the facility to vary air stream velocity with little or no effort.

First, let us consider the better known airplane-type subsonic wind tunnel. Here one merely causes air to go through a test section at high velocity by forcing the air through with propellers and narrowing the channel of the test section. The air circuit may be continuous, or the tunnel may exhaust into the atmosphere. Supersonic flow, however, is an entirely different problem. With sufficient power, velocity can be increased in a wind tunnel up to sonic velocity by narrowing the channel, just as one increases the exit velocity of a fire hose by a convergent nozzle. However, no amount of pressure or convergence will cause velocity to exceed that of sound, even at the narrowest part of the system. Velocity, to exceed that of sound, is achieved at the expense of decreased density by using a diverging, or flared, nozzel. Thus, we narrow the channel to get sonic velocity and then widen it, in a very special and very peculiar way, to obtain a velocity in excess of that of sound.

For each supersonic speed, a specific and unique shape of flared section is required. Thus, one must have a separate throat for 2.5 times the velocity of sound, for 2.6, and for each speed desired beyond that of sound. Heretofore, one has not only had to have a most carefully-constructed throat section for each desired speed, but the changing of a throat sometimes required several days.

As a consequence of these conditions, supersonic wind tunnels have been limited in practice not only to a very few mach numbers (a mach number is speed in term of the velocity of sound, at sea level, as a unit), but still more limited as to the frequency with which they change mach numbers. A flexible throat, in which one can achieve a mach number at will, has been the dream of the aerodynamic world for many years. This high - speed flexible - throat supersonic wind tunnel removes from the experimental aerodynamicist the shackles which have, until now, both slowed his progress and limited the latitude of his experiments.

The main purpose of the New Developments page is to keep our readers informed of the latest advances in the engineering field. If any of the short items arouse your curiosity, drop us a card and let it be known. If more material is at hand on the subject, or is obtainable from the manufacturers, we will try to work it into a full length article for your pleasure.

New Uses for Wood Products

There have been some rather startling developments in the field of wood product. This is especially true in the case of waste materials. A method has been devised to form the sawdust and mill shavings into the shape of small logs. They are then compressed at 50,000 pounds per square inch. These artificial logs find use as fireplace fuel.

Another new development that has added to the usefulness of wood products has been the introduction of dielectric heat to various glued joints. This type of wood welding makes it possible to fabricate strong joints without the aid of metal fasteners.

A Party-Proof Cabinet

The plastics industry has perfected a material that is almost indestructible. The stuff, a composite plastic with a striking resemblance to mahogany, simply won't mar. It can't be scratched, dented, chipped, cracked, burned or broken.

Cabinets made of the material have been subjected to such severe tests as being slammed by bottles and heavy ash trays. Cigarettes and cigars have been left to burn out on the surface, nail polish remover, alcohol, grease, hot salt water, and citrus acids have been poured on it, 110 pounds of live weight have skipped rope on its top. No deal—it has emerged unscathed in each instance.

The plastic is easily fabricated, and is being used in the manufacture of timing gears, refrigerator liners, and fan blades.

New Airforce Planes

The United States Air Force has officially revealed two new fighters and a sonic research plane.

They are the following:

McDonnell's XF-88, a sweptwing, supersonic fighter. This plane is powered by a pair of Westinghouse 24C jet engines slung internally in the fuselage belly under the wing. Top speed is better than 720 m.p.h. Other specifications are wingspan of 40 feet and the fuselage is 55 feet long. The wings and tail surfaces are swept back at an angle of 35 degrees.

Northrop's XF-89, a heavy, straight wing, twin jet night fighter. Power is supplied by two General Electric-Allison J-35 jet engines. Top speed is said to be well over 550 m.p.h. The wingspan and fuselage are both approximately 50 feet. This plane carries a pilot and a radar operator who sit tandem in a pressurized cockpit.

Northrop's X-4, a sweptwing, twin jet, research plane. This ship is designed to explore stability and control problems at high sub-sonic speeds. It is powered by two Westinghouse 19XB jet engines. It uses the elevons developed by Northrop on its flying wing type aircraft for aileron and elevator control. The X-4 has no horizontal tail surfaces, but it does have a large vertical fin. The fuselage is 20 feet long, and it has a wing span of 25 feet.

The Perfect Soldier

A portable "electric weatherman" which automatically and continuously records data in remote, unmanned weather stations has been developed for the U. S. Army Signal corps.

The device, built by the General Electric company, is slightly larger than an infantryman's pack. Time, wind, speed and wind direction are marked continuously on a moving roll of paper long enough to make an 800-hour record. Hence the unit requires attention only once a month.

The "weatherman" uses no ink in its records. Moving arms, connected electrically to a conventional anemometer and to a weather vane, mark specially sensitized paper by sending sparks through it. The instrument can register wind velocities up to 150 miles per hour and can read directions correctly to within 1½ degrees.

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Volume 64 **Number 3**

The Tech Presents

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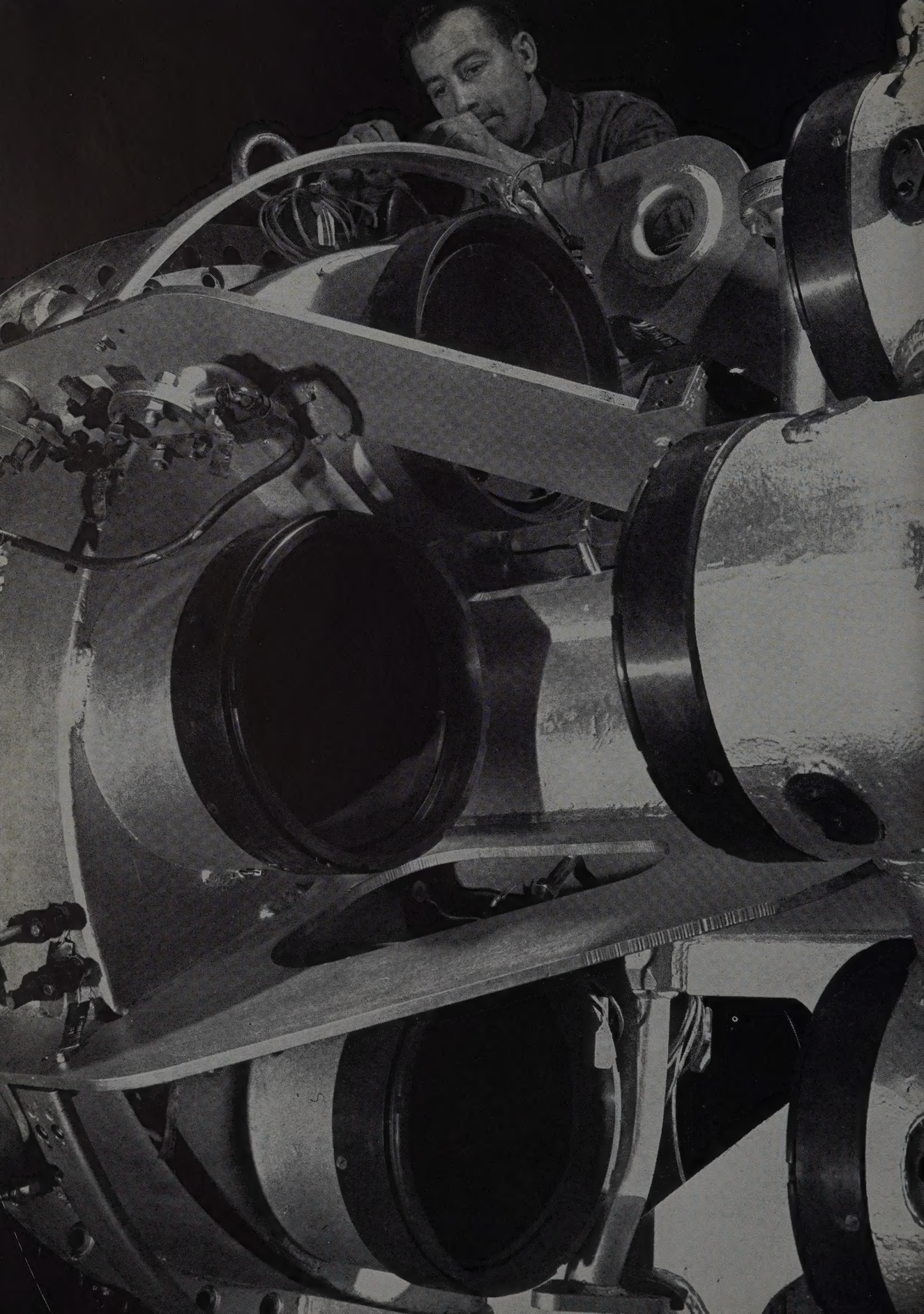
OUR COVER

This neat bit of "darkroom deception," rigged up by one of our versatile staff members, C. M. McCymonds, shows Jack D. Easley, C.E. '50, up bright and early one Saturday morning looking at some of the more interesting scenes of South Campus.

FRONTISPIECE

Three of the six combustion chambers in a developmental locomotive gas turbine will connect the black-edged aperatures. A technician is shown making adjustments as the 4,800-horsepower engine is reassembled after having been dismantled for inspection. (Photo courtesy of General Electric.)



What's in a Name?

By JOHN A. HENRY, Associate Professor of Mechanical Engineering

Did you ever notice that one item all "applications for employment' have in common is References: _____? Apparently this is no small detail in the minds of the men who make the selections of future employes.

This article, prepared by a professor in the mechanical engineering department and also adviser to the Technograph, gives an insight into how you can proceed to obtain a letter of reference.

About the end of every semester, and especially in the spring, come many requests from seniors for letters of recommendation by members of the faculty. This is one of the little outside jobs that Professor Z has to do, and, in general, he faces it with mixed feelings. There are times when he is delighted to have an opportunity to do something that will give a first class man a well-deserved boost. In fact, that is one of the joys of the job. There are, alas, some times when he wishes the person in question didn't have such a naive impression of his instructor's gullibility. When puzzled as to the reason for his selection, Professor Z looks up the student's grade record to see if, by chance, he gave him an A, and (as is sometimes the case), the only A in the files.

Before discussing this matter at any length, let's see what a letter of recommendation really means. A person who teaches in a college or university is generally regarded by the outside world as a person of integrity, regardless of other less flattering attributes that are alleged to make up the character of the "typical college Prof." In effect, when Professor Z writes a letter of recommendation for student A, he is putting his own reputation in jeopardy for a person of whom the recipient knows little. The teacher has everything to lose and nothing to gain. Being a kind sort of soul at heart, the average teacher will stretch a point or two to accommodate a student whom he does not believe to be a washout. Of course, there are times when Professor Z should, and does, turn down such a request on the grounds that he does not know enough about the party. Again, being a kindly old gentleman, he may use that excuse when in reality he knows too much.

Is this a square deal for either of the parties concerned? It may not be in many cases. When whole-hearted understanding does not exist, the teacher is left with a bad taste in his mouth, the student gets an indifferent recommendation, and the prospective employer faces the alternative of taking the letter at face value or reading between the lines.

Should the student refrain from asking for recommendations from his teachers? By no means. If a student has confidence that Professor Z can, and will, vouch for him, he should ask him, and in general, he should ask permission before suggesting him as a reference. But let us be honest about these letters. It is not too much of a triumph to secure one. Someone is usually willing to make a half-hearted attempt. The situation is grave indeed if no one is willing to vouch for a person.

The prospective employer is not interested in finding out the grade point average of a student, or his general scholastic ability. That he can secure from the college office. The boss wants to know about personality traits. Is the student honest? Can he make friends and keep them? What kind of associates does he keep? Is he willing to assume responsibility? Can he lead? Can he follow? Unfortunately, most of these traits do not come to the surface in the classroom, or even in the laboratory. Professor Z doesn't know how to answer these questions for nine men out of ten who pass before him, but luckily for him, seven of the nine realize that and do not embarrass themselves or poor old Z.

How can some of these nine men build themselves up to the point where they rate the favorable notice of their professors? The answer is simple. *Take part in a worthwhile campus activity,* preferably one in which the same teacher can guage both intellectual and social performance. The part must be taken whole-heartedly, and an important contribution to the organization must be made; mere membership is of little value. Is this apple-polishing? It certainly is not. Growth in character and social grace is an important part of educational life. Personnel men tell us that for each engineer discharged for technical incompetence, nine are released bcause of personality traits.

Let us dive into the files of our hypothetical Professor Z and come up with some of his hypothetical letters.

"Mr. B. Z. Bee was in one of my classes in earthworm navigation. He was a better-than-average student, but not outstanding in this subject. However, as faculty adviser to the student chapter of the Society of Tonsorial Engineers, I had an excellent chance to observe his actions as chairman of the membership committee. He did an excellent job, not only by his individual efforts, but also due to his leadership in getting others to share his enthusiasm and duties. He looks like an excellent employment risk."

"Mr. Eager Beaver was not in any of my classes, but his excellent scholastic rating speaks for itself. He was selected to serve as a laboratory instructor in his senior year during the past emergency, and was under my jurisdiction. I can state that he was conscientious, dependable, and well-received by the students. He looked up most of the technical information by himself, but when in doubt, he did not hesitate to come for advice and knew what he wanted. I would hire him myself for any job requiring intelligence, drive, and tact."

"I have your letter of February 6 inquiring about Mr. Fair. He was in one of my classes and did work that was a little better than average, but I can tell you little about his personality or habits, as requested. From superficial observation, I imagine that he would do well on some types of work, probably if carefully supervised at first."

Notice that the payoff comes in the last sentence in each case. What would you, as an employer, think of them? Finally, let Professor Z write two more hypothetical letters, both of which would give him much joy—if he then tossed them in the wastebasket.

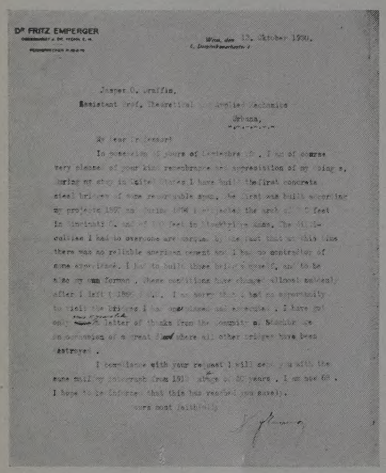
"I have your's of February 7 requesting information about I. M. Good. He did not ask my permission to use my name, but there are one or two things I'd like to say about that young man. He is probably one of the smartest men I have ever had in class, but he knows it. He likes to come in after an examination and have his 99 raised to 100, despite excess of leniency already granted. He belonged to the student branch of the Terpsichorean Engineers, but I am told that he repeatedly refused to take any part in the "infantile antics of his fellows!" He has no known friends.

(Continued on page 28)

Engineering Hall of Fame

by George Heck, C.E. '52

Throughout this great campus of ours there are to be found many interesting scientific, historical, and literary exhibits on display. These exhibits reflect directly upon the colleges which they represent and they add quite a bit of fame and prestige to those colleges. The Col-



Dr FRITZ EMPERGER

Wien, den 13. Oktober 1930.

Jasper O. Draffin,

Assistant Prof. Theoretical

Urbana,

Dear Sir:-Assort

In accordance with yours of October 8., I am of course very pleased, of your kind remembrance on appreciation of my doing a, during my stay in this country I have built the first concrete steel bridges of more or less notable span, the first was built according to my system 1897 near Berlin 1898 at and over the Spree at Treptow in Berlin, and of 150 feet in the single span. The 60 the railroad I had to overcome are various, 1) the fact that at this time there was no reliable empirical record for I had no confidence of some experiment, I had to built those bridges myself, not to be sued on some former, those conditions have change almost entirely after I left 1900 . . . I never had a lawsuit personally to visit the bridges I am confident are standing . I have not copies of the letter of thanks from the Communities, Municipalities or Governments of a great many where all other bridges have been destroyed .

I coincidence with your request I will send you with the next mail my photograph from 1901 about a 30 years . I am now 60 . I hope to be informed that this has reached you safely .

Yours most faithfully

Emperger, an early builder in reinforced concrete who advocated the use of hooped columns with cast iron cores, sent the above letter to Professor Draffin.

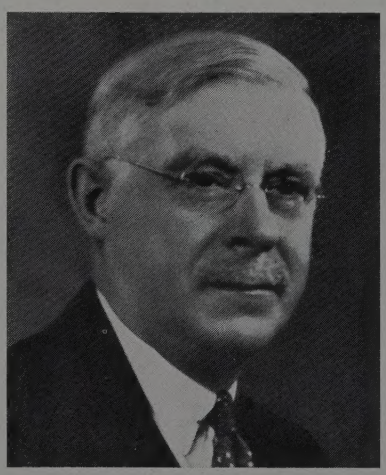
lege of Engineering is no exception to this rule, and it claims possession of a complete collection of portraits which compose our own "Engineering Hall of Fame."

Within the doors of the Arthur N. Talbot testing laboratory, and adorning the walls and hallways therein, can be found an assembly of portraits of engineering heroes whose names shall live forever in the annals of engineering history. When one walks down these halls he cannot help but feel humble in the midst of these great men. This collection, of which there is no duplicate in any other college or engineering institution in the United States, is the product of countless hours of research, correspondence, and personal effort by Jasper O. Draffin, professor of theoretical and applied mechanics.

Mr. Draffin gained his degree at the University of Illinois; after teaching three years at the University of Ohio, he came back to teach here at the University of Illinois. He began this assembly of pictures sometime during the year 1929 and has continued through to the present day. During the war years his collection was halted because he acquired many pictures from great European engineers. Now, with the presence of peace, Mr. Draffin is again starting to add to his library of portraits the pictures of the many new scientific greats who have emerged out of wartime research and discovery. The majority of the pictures, of which there are over three hundred, were gathered by Mr. Draffin during the ten-year period following 1929. He obtained these photographs, etchings, sketches, and paintings from rare engineering and history books, magazines, the men themselves, and from their families. He has corresponded with men from all over the world, including America, England, Europe and Asia, and has gathered many interesting replies from these engineering geniuses. Although most of the men were humble in their ways, they were always anxious to supply their pictures, proving the fact that you can be a genius and still remain human.

The fields of engineering in which these men were most active are mechanics, metallurgy, hydraulics, strength of materials, engineering mathematics, and testing of materials. The selection of the men who were to have their pictures hanging from the walls of Talbot laboratory was made by Mr. Draffin, who chose only the best known and most outstanding men in the above mentioned fields.

We congratulate Mr. Draffin for his contribution to the University of Illinois by his assembling this valuable collection of which any engineering student can be justly proud. We can only look with awe at the achievements represented by the pictures of these men and proceed to endeavor to accomplish the completion of our tasks that will face us in the engineering world as well as they accomplished theirs.



PROF. JASPER O. DRAFFIN

General Electric Employment

A record number of more than 1400 graduates of 150 colleges and universities have been hired by the General Electric company this year, surpassing by almost 600 the previous high mark of last year.

Expansion of the company, coupled with the effects of the war-time shortage of graduates, led to selection of this record number.

Of this group, 1046 are electrical, mechanical, and industrial engineers. Fifty chemistry and fifteen physics graduates also have been selected.

The new college-trained employees will enter General Electric's $1,000,000 education program, which includes not only technical, scientific, and business courses, but also apprentice training for high school graduates.

The largest number of the graduates are engineers who will enter the test course, which more than 20,000 have completed during past years. At the present time, 1,339 student engineers are enrolled in the test course, to form the largest single group in company history.

During their twelve to fifteen months of training, the student engineers work a full shift testing electric apparatus and then take advanced classroom courses in the evening.

Others will be assigned to the rotating engineering or physics programs conducted by the G. E. general engineering and consulting laboratory, or the program for chemists and metallurgists conducted by the G. E. chemical department.

Several hundred women college graduates are employed each year, the majority of whom have backgrounds in mathematics, physics, and chemistry. A small number of women are trained as student engineers.

The Triangle chapter house on the University of Illinois campus is seen on the left, while on the right is the Sigma Phi Delta house.

Professional Fraternities for Engineers

By Arthur Dreshfield, Ch.E. '51

and Robert Beals, Assistant in Ceramic Engineering

The social fraternities exclusively for engineering students are described in this set of articles. The organizations have for their objective the aiding of the student to become a good engineer and a good citizen. To do this, they offer a social program which tends to produce a well-rounded individual but still emphasizes the importance of scholarship. Members are encouraged to participate in extra-curricular activities in which they have a true interest.

TRIANGLE

There is one feature which makes Triangle fraternity different from most of the other 55 fraternities on the campus. All of its actives, and all of its many honorary members, are in some phase of engineering field, or are students of engineering or architecture.

Thus, a member of Triangle has an immediate common bond with every other member, over and above the fact that they are fraternity brothers. Such a mutual interest has many benefits, for it serves to stimulate an added interest in engineering among the members.

Founded on this campus 46 years ago by 16 students, Triangle originated as a fraternity exclusively for civil engineering students. Incorporation papers were granted in April, 1907, giving the fraternity its official beginning. April 15 is designated as Founders' day.

Interest in the organization spread rapidly to many engineering schools and universities with engineering colleges. In 1909 the Purdue chapter was installed, followed soon by chapters at Ohio State, Wisconsin, and Kentucky by 1920.

Up to that date, Triangle had been limited to civil engineers only. It was felt, however, that the fraternity would be improved and that the members would receive greater benefits if this limitation were relaxed somewhat. With this in view, the various chapters consented to a revision of the chapter, which allowed the initiation of persons in any engineering curriculum.

This step catalyzed the growth of the fraternity, with the result that it has grown steadily and rapidly. It now has a chapter at every Big Nine school except Indiana, as well as chapters at Cincinnati, University of Kansas, Missouri School of Mines, Penn State, South Dakota School of Mines, Marquette, Louisville, and Cornell. Thus, it now has 18 chapters scattered throughout 13 states. Its growth, like that of most fraternities, was halted by the war, but there seems to be no reason why it should not now continue to expand.

Scholarship is of prime importance to members of Triangle. Initiates are required to have a 3.4 average, which is above the University minimum requirement. In addition, the national organization maintains a scholarship cup and awards it annually to the chapter with the highest scholastic average. This award is eagerly sought, and it en-

(Continued on page 30)

SIGMA PHI DELTA

"The promotion and advancement of the engineering profession and engineering education; the instilling of a great spirit of cooperation among engineering students and their organizations; the inculcation in its members of the highest ideals of Christian manhood, good citizenship, obedience to law, and brotherhood; and the encouragement of excellence in scholarship" are the objectives of Sigma Phi Delta fraternity. The motto: "Pro Bono Professionis," which translated from the Latin means, "For the Good of the Profession," further bears out the objectives of this international social fraternity of engineers.

Alpha chapter of Sigma Phi Delta fraternity was founded at the University of Southern California on April 11, 1924, making Sigma Phi Delta one of the youngest of the national fraternities. Delta chapter of Sigma Phi Delta was established at the University of Illinois January 25, 1928. There are seven chapters in existence today. They are located at the University of Southern California, University of Illinois, North Dakota State college, Marquette college, and Tri-State college. Prior to World War II, active chapters were also located at the University of South Dakota, University of Texas, and Tulane University.

The Greek letters sigma, phi, and delta, stand for science, friendship, and duty. The colors of Sigma Phi Delta

(Continued on page 42)

Solid Phase Welding

By Carl Sonnenschein, Assistant in Mechanical Engineering

No longer is welding merely the tool of the repairman. Having taken its place as a production tool, the techniques and methods of welding have increased in numbers and complexities. This article introduces a new and different concept of welding as an important manufacturing process. Considered also, are the technical and metallurgical bases of solid-phase fabrication.

The objectives of this article shall be three in number. Organizationally, the article will first present an introduction to the ideas and theories of solid phase welding; secondly, the problems in ferrous metallurgy, inherent in solid phase welding will be considered; and lastly, some brief consideration will be given to the industrial problems which may influence the general use of solid phase welding as a production tool.

As the name implies, solid phase welding is concerned with the "fusing" of two pieces of metal while they are still in the solid state. Of the more widely known types of welding, there are oxy-acytelene, flash, arc, atomic-hydrogen, and several others, all of which cause the metals to become molten prior to the fusing process. There are also methods, such as brazing, in which only the bonding metal actually becomes molten. All of these above mentioned welding methods may be broadly classified as falling within the group known as liquid phase welding methods.

In liquid phase welding, the diffusion of the one metal into the other, is a function of the fluidity and missibility of the two molten constituents. Due to the above stated functional qualifications, the weldment may possess greater or lesser degrees of homogeneity across the weld.

Whenever metals are made molten by the addition of high temperatures, there is always a great danger of entrapment of gas bubbles or possible oxidation of the metal in the immediate zone of the weld. Both of these conditions are undesirable and tend to produce weak and brittle welds.

The subsequent solidification of the weld metal, in liquid phase welding, will be accompanied by recrystallization and in many cases unequal grain growth depending upon the physical dimensions of the weld. The conditions, as stated, may be responsible for high intercrystalline stresses as well as other undesirable physical characteristics. It is for the purpose of achieving homogeneity of structure and physical properties that most liquid phase welds must be subsequently heat treated when close tolerances and specifications must be met.

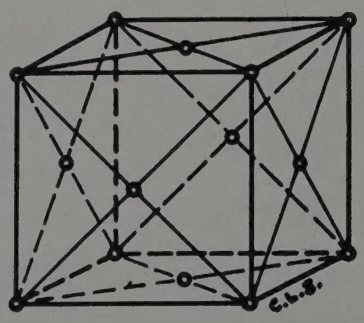
These characteristics of liquid phase welds have been discussed so that they may serve as a background for the following discussion of the solid phase welding technique and the results achieved with it.

"Solid-phase welding is the process by which particles or members are bonded by atomic forces without the presence of a liquid phase at any stage of the process."[1]

In this age of atomic-power, it seems most fashionable to consider everything and anything in the light of the atom, but in this case it is an absolute necessity. In order that the process of diffusion may be better understood, the lattice structure of gamma iron will be considered.

Gamma iron possesses a face centered cubic lattice which has "closely packed atoms in 12 directions and since slip or shear occurs along these planes,"[2] it is capable of a great degree of deformation. The degree of plasticity which a metal will show, is directly a function of its degree of deformation.

No attempt will be made, at this time, to explain all of the theoretical hypotheses which have been advanced regarding diffusion, but rather an attempt will be made to qualitatively define diffusion as it is normally intended when the subjects of welds are at hand. Normal, complete diffusion in a weld, shall be understood to mean that when the weld is subsequently examined, under the most powerful available device, no evidences shall be found of discontinuity or non-homogeneity of the crystalline mass.



FACE CENTERED CUBIC LATTICE

With the above stated criteria as an objective, the full case for solid-phase welding as applied to the ferrous metals can be considered.

As has been stated, the gamma iron possesses a face centered cubic lattice which has properties of high plasticity. However, inspection of the iron-iron carbide diagram will reveal that the metal must pass through at least one allotropic change before the gamma phase is achieved. Without going into the matter too deeply, it has now become obvious that in order to achieve the greatest potential diffusion, the temperature of the particular metal must be in excess of the Ac_3 temperature for that particular composition. This then will fix the lower limit of temperature range to be used.

Having already decided that this process shall at no time involve any liquid phase, the top temperature limit is automatically fixed by the solidus line or freezing temperature of the metal.

Briefly consider the constituents of the metal in the above stated range. The material is composed of a solid solution of iron carbide in gamma iron. This composition is known as austenite and is the most important composition for the heat treatment of steels that exists. In this range, recrystallization takes place automatically when the metal is held for the proper period of time at temperature.

It is commonly recognized that some degree of interface diffusion will take place between any two metals if they are maintained in contact and at an elevated temperature for a long enough period of time. However, the length of time required may be so great that it presents insurmountable practical difficulties and also, the presence of an oxide film, at the interface, may bar all diffusion to a very great extent.

As a result of the difficulties encountered with mere surface pressures, the solid-phase process is of necessity

one involving the use of selected high pressures as well as temperatures.

The introduction of high pressures into the process immediately introduces the problem of the upsetting of the plastic metal. The theory relative to the use of pressure, to increase the rate of diffusion, has been well substantiated and has been explained upon the basis of two separate arguments. The atomic theory of diffusion contends that the mean free path of the atoms in the space lattice is no greater than the inter-atomic distance. This being the case, in order for the atoms to be able to displace themselves into other lattices, especially those of another and disconnected crystal, every effort must be made to insure the very closest crystalline approach that is possible and required under the circumstances,

As was previously mentioned, the presence of an oxide layer on the interface is a great deterrent to diffusion. The upsetting, due to the pressure, causes a greater surface area to exist at the interface, and in as much as the oxide film is of a definite area, it will be broken and cracked in several places. Once the film has been partially dispersed, the process of diffusion can proceed as intended.

Time, as a governing factor in diffusion, has already been alluded to. A cursory perusal of the facts would cause one to immediately assume that the rate of diffusion is a function of time, temperature, and pressure, and such is the case. However, what is more difficult, all three variables are in turn functions of one another and this leads to some complicated mathematical expressions. The general LaPlace partial differential equations have been adapted to the theoretical determinations of the correct combinations to use when the other variables, such as the lattice dimensions and the closest approach distances, have been established.

The concept of the mathematical prophesy is not a new one to the engineer although he has always demanded that the theory be substantiated by tests. It is with the results of various tests that this paper must now deal.

Kinzel[1] reported the results of a series of over 500 tests which were made at the research laboratories of the Union Carbide and Carbon company. The tests reported included some in which non-ferrous metals were used. These tests will not be reviewed.

Of the tests which were performed, two series, those which were at constant temperature and those at constant pressure were the most enlightening. Through the medium of maintaining one variable fixed, an empirical relation could be obtained for the proper cycle for the different materials tested.

Ingot iron, S.A.E. 1020, and S.A.E. 1045 were the materials used in the temperature and pressure calibration tests. These materials, not being alloyed, the various states on the iron-iron carbide diagram can be easily determined.

The critical temperature for the ingot iron was found to be in the neighborhood of 1900 F (1050 C) when very low axial pressures were used on the test bars. With the pressures used, there was no upset of the metal even at this elevated temperature. The ingot iron, being something of an oddity, no more time will be placed upon the results with the low carbon steels.

The pressure used for the tests in which the temperatures were varied, was 500 psi. At this pressure, it was found that practical minimum temperature, so as to achieve the previously stated criteria, was 2250 F for the S.A.E. 1020 steel. Approximately the same result was obtained with the S.A.E. 1045 steel.

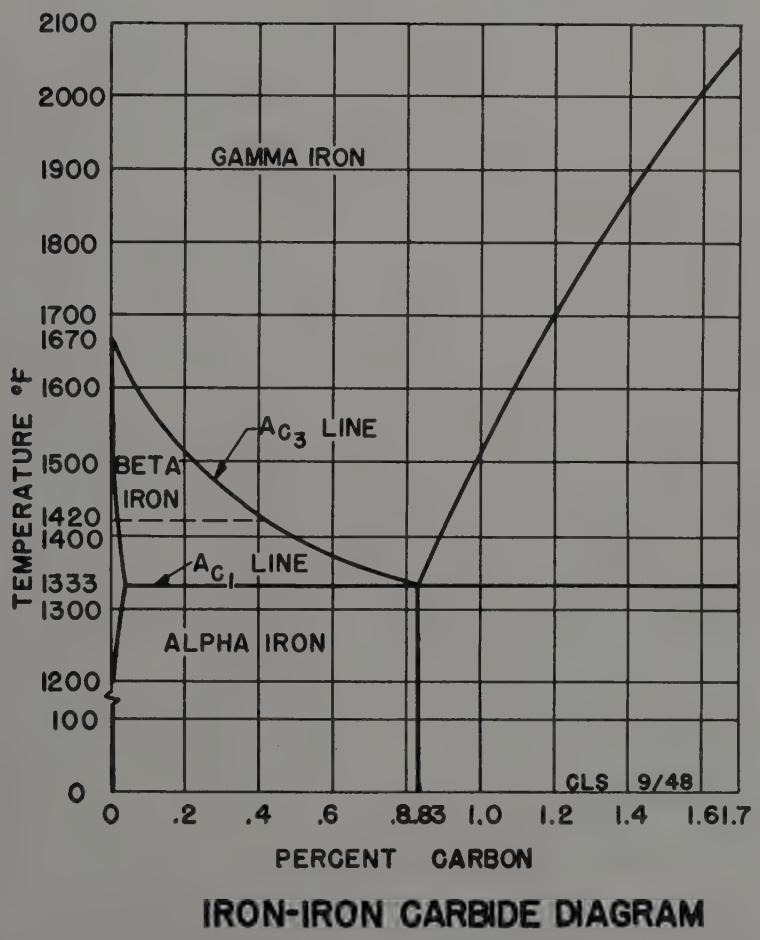
However, from the purely engineering standpoint, there exists another criteria of performance which is much more important than the previously stated metallurgical criteria.

The problems with which the engineer is faced are those which concern the usable physical characteristics of the material. The ductility and the endurance limit, of the weld material, were felt to be the criteria for acceptance or rejection by the engineer. This is based upon the assumption that the virgin metal already possesses those qualities which the designer desires. Therefore, it is necessary to know whether or not the ultimate physical properties of the weld zone will limit the usefulness of the weld as a creative process.

Determinations of the various physical properties, and in particular those mentioned above, of the solid-phase welded materials has been investigated by Lytle[3], Durst[4], and others besides Kinzel.[1]

Generalized conclusions as to the physical properties of the solid-phase weld in ferrous metals can be drawn from the work that has been done. However, in most cases, it must be borne in mind that in order to obtain the optimum conditions, a post-cooling normalize must be used. Although the method shows good homogeneity and refined grain structure, there is always a pos-

(Continued on page 34)



IRON-IRON CARBIDE DIAGRAM

For Men of Expectations . . .

ELECTRICAL ENGINEERING DEPARTMENT
University of Illinois

PART II

Functional Classification of Engineering Jobs

There are a wide variety of functions performed by engineers in each of the engineering fields. On a functional basis engineering jobs may be divided into research, development, design, production, test, application, sales, service, construction, and operation.

The *research engineer* devotes his energies toward extending the horizons of knowledge. This involves a search and study of the literature on a particular subject, calculations to verify theory, and experimentation to prove, reject, or modify theory. In *pure* research the engineer investigates physical laws for the purpose of increasing scientific knowledge, without being particularly concerned with the immediate applicability of his discoveries. In *applied* research the engineer has as his aims the solution of specific manufacturing problems, the development of new equipment, and the discovery of new materials for which there is a need.

The *development engineer* takes the results and discoveries of research and develops them into useful methods, products, or apparatus. Development involves considerable analytical and experimental work in order to get a product into its final form for production.

The *design engineer* is responsible for the preparation of the detailed plans and specifications from which a piece of apparatus is produced or a system is constructed. He makes the necessary calculations and sketches, writes or supervises the writing of the electrical and mechanical specifications, selects the materials and processes to be used in manufacture, helps prepare specifications for test procedure, and established acceptable performance standards. The design engineer must be analytically inclined and have the ability to visualize what goes on in the operation of a given piece of equipment. He must keep up with new developments and know the patent situation in his field.

The *production engineer* is responsible for the manufacture of products and apparatus from raw materials and designs. He analyzes the methods, processes, and equipment used in manufacturing. He works with the design engineer on manufacturing problems in order to keep costs to a minimum. In addition to a good engineering background and a good knowledge of industrial management and manufacturing operations, the production engineer must know and be interested in people.

The *test engineer* is in direct charge of the actual testing of apparatus and equipment to determine if it meets specifications and accepted engineering standards. It is his duty to see that correct and standard test methods are safely applied. He consults with the design engineer on special testing problems and methods. He also works to develop improved and cheaper methods of testing.

This, the second and concluding installment of this article, reviews the functional classification of engineering jobs, the responsibility classification of engineering jobs, the objectives the engineering student should have in mind while he is in college, and the essential tools of the engineer.
Part I of this article appeared in the November issue.

The *application engineer* solves plant and system problems. He recommends specific equipment and coordinates the engineering requirements of an entire installation. He informs the design engineer of the characteristics which each piece of apparatus in a system should have. In a manufacturing company he also acts as a consultant to the sales organization and helps select specialized equipment which will best serve the customer's needs.

The *sales engineer* is the manufacturer's sales and engineering representative who works directly with the customer. He studies the customer's needs and makes engineering applications of equipment. He must know his companies' equipment thoroughly so that he can explain its design, construction, and operating features to the customer. The sales engineer also negotiates the sales price of the equipment and its delivery date. In addition to his technical training, he must have the ability to work with people and a personality that inspires confidence.

The *service engineer* supervises the installation of new apparatus and performs the final tests. He investigates customer complaints and corrects troubles found in the field. He directs repair work, and in cases of emergency, he restores operation as soon as possible. The service engineer must have a broad engineering knowledge since his work covers a wide field. Service work also requires initiative, ingenuity, resourcefulness, and the ability to direct people.

The *construction engineer* supervises the construction of facilities and structures such as plants, transmission lines, air fields, and radio stations from their proposed designs and plans. In addition to technical problems this involves the procurement of materials, the selection and proper use of construction equipment, and the handling of men. The ability to work with and direct the work of others is as important to the construction engineer as his technical background.

The *operating engineer* is charged with the responsibility of operating a part or a whole enterprise safely, efficiently, and without interruption. He may work with a group of machines, a plant, or a system such as those found in the electric-power, communications, and transportation fields. He supervises the procurement of supplies and repair parts, supervises the protection and maintenance of the equipment, selects and coordinates new equipment, and directs the operating personnel. In case or breakdown or emergency he must have the ingenuity and resourcefulness necessary to restore operation under the most adverse conditions. The operating engineer must have a broad engineering background and must be able to handle men.

The above sequence does not imply the relative importance of the various classifications. It is based largely upon the order in which a new discovery is usually handled until it has been made useful to man. It also indicates the extent to which the engineer must deal with things and people. Research and development engineers deal primarily with things; at the other extreme, production, sales, service, construction, and operating engineers must know and be interested in people.

It should be pointed out that not all companies will need every classification listed, as this depends on the exact type of business involved. Also, in some companies one engineer may perform two or more of the functions.

Responsibility Classification of Engineering Jobs

The work of the engineer in any of the preceding classifications can be further classified on the basis of the type of responsibility involved—that is, into technical, supervisory, and executive work.

(Continued on page 36)

Light Detected by Sound

By Ray Hauser, Ch.E. '50

Despite the many differences between sound and light, there has been found a definite coupling action between them. The effect of infra-red radiation on a field of supersonic sound is being studied by Professor W. J. Fry and assistants, in the electrical engineering research laboratory. Specifically, the project is the detection of infra-red rays by its measurable effect on high frequency sound. This method of detection has been found to give greater sensitivity and more rapid response to radiation than has been heretofore possible. This is of extreme importance to the Army air force, sponsor of the research project. Hot exhaust gases from airplanes radiate considerable quantities of infra-red. If supersonic detection of this radiation is sensitive enough, it may supplant radar as a method of airplane warning. The research is still in its fundamental stage, so it isn't known yet if suitable aircraft indication is practicable.

The new and ingenious feature of the rather complicated-looking apparatus is an acoustic interferometer—an infra-red detecting device. The amplifier, oscillator, detector, oscilloscope, and vacuum tube voltmeter are standard units. Their functions, at least, are known to most engineers, and their relation to the detector unit is shown by the block diagram. The gas control equipment is necessary to provide accurately known compositions of gas mixtures used in the interferometer chamber. The vacuum pump makes possible a continuous flow of gases through the chamber. Temperature measurements and heater controls are of great importance. The interferometer must be kept within one-tenth of one degree centigrade variation, as the character of sound transmission through the gases is found to vary considerably unless the temperature is kept constant.

An outline of one of the fascinating investigations in progress in the electrical engineering research laboratory, this article also indicates some practical applications. The project is the detection of infra-red rays by its measurable effect on high frequency sound.

The acoustic interferometer is the key to the whole detection apparatus. It is a well insulated, sealed chamber containing two x-cut piezo-electric quartz crystals. These are the same type that are used in radio transmission. The spacing between the crystals is varied with a micrometer screw. A potassium bromide crystal on the side of the interferometer acts as a window, permitting infra-red radiation of up to 25 microns wave length to pass into the chamber between the two quartz crystals. A simple heated body, variable from room temperature to red heat, is used as the source of a wide band of infra-red waves.

A mechanical shutter between the hot body source and the interferometer window cuts the beam at frequencies variable from five to 100 cycles per second. It is simply an evenly notched disk that rotates at a constant rate, alternately permitting the infra-red beam to enter the chamber, and blocking its path. Thus, the gas in the interferometer chamber is exposed to periodic radiation.

High frequency radio waves (932 kilocycles) are generated by the oscillator, amplified, and impressed upon the upper piezo crystal, causing mechanical vibration at supersonic frequencies. This vibration excites the gas mixture and is transmitted through the chamber where the gas absorbs infra-red radiation. Periodic exposure to the beam changes the transmission character of the gas and its wave motion is consequently modulated according to the shutter frequency.

The detector crystal (exactly like the driver crystal) receives these modulated waves and responds by vibrating "in tune" with the supersonic vibration of the gas. Piezo-electric crystals generate voltages characteristic of their vibration and dependent upon the amplitude and frequency of the wave causing the vibration. Hence, the voltage generated in the detector crystal varies with the modulated supersonic waves subjected to infra-red radiation. The voltage is amplified and fed into a detector circuit much like that of an ordinary radio. Variations of wave pattern may be seen

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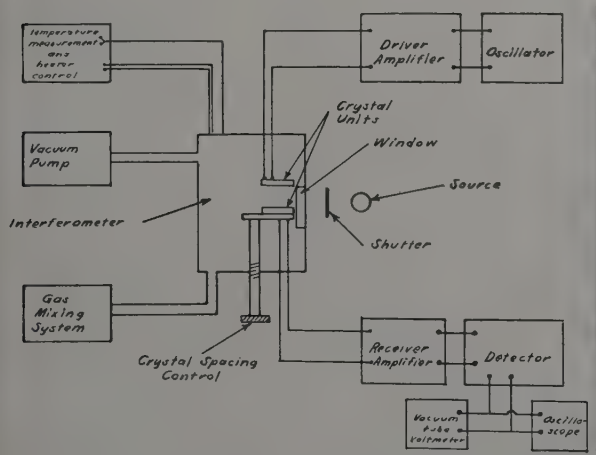
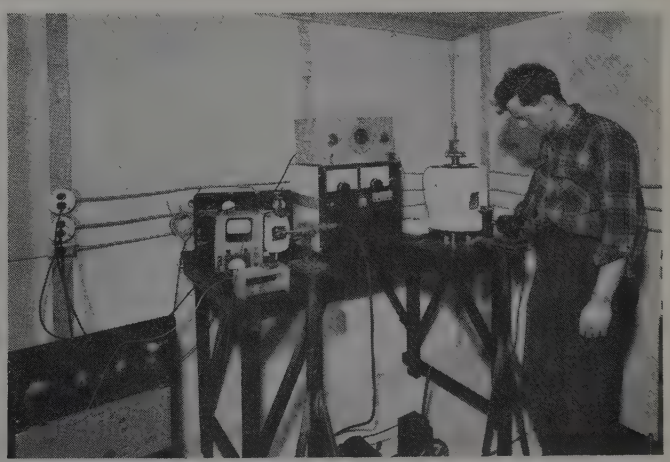
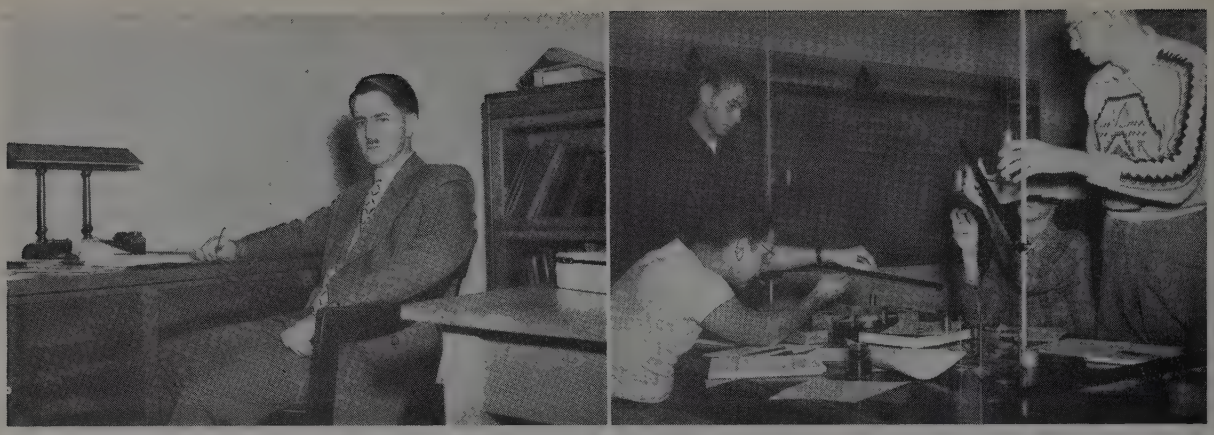




Frank Fry, research associate, inspects the main piece of equipment used in the present research project of the electrical engineering laboratory. On the left is shown a simplified block diagram of the same piece of equipment.



On the left is seen Mr. A. M. Johnson in his office, which is always open to students with or without problems, while on the right a group of first semester students work on the derrick problem in one of the well-equipped laboratories at Galesburg.

Undercover at...

GALESBURG

MEET MR. PHYSICS

By Luther S. Peterson, E.E. '51

It has been said that knowledge of the physical world that surrounds us is the knowledge of life itself. To acquire this knowledge is a task which is remembered by seniors and juniors, is being experienced by sophomores, and is yet to be realized by freshmen. However, this is not the difficult task it once was when a student was required to improvise all of his experimental equipment.

Such was the situation prevailing here at Galesburg at the start of the fall semester of 1946. This condition, which was conquered quite commendably by the many students involved, is no longer present. War surplus equipment, plus equipment which was sent here from Urbana, has aided in the development of our present physics department. It now ranks with comparable institutions throughout the country.

The department is split up into two definite, but closely related, sections: pre-med physics, led by Miss Zielesh, and engineering physics, led by Mr. O. Estes and Mr. A. M. Johnson. Through the medium of their instruction, the student obtains a usable knowledge of mechanics, heat, sound, electricity, and wave motion. The knowledge of these fundamental principles is indispensable to the engineer in his further pursuance of knowledge of the physical world. To the pre-med student, an understanding of these principles is necessary so that he will be able to operate and understand the varied equipment which is used by his profession in the healing of the human body.

Knowledge of the physical world and its many peculiarities is not restricted to the engineer or the pre-med student, but is helpful to all who wish to have a scientific background adequate to face the problems present in our "atomic age." The presence of equipment such as oscilloscopes, Wheastone bridges and galvanometers, coupled with able instructors, enables anyone to obtain such a background here at Galesburg.

MR. A. M. JOHNSON

By Dean R. Felton, C.E. '51

The honor of being the third person hired at our Galesburg undergraduate division goes to Mr. A. M. Johnson, who is one of the most well-known teachers on the campus.

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Mr. Johnson has aided in the growth of our division in that he has been one of the leaders in setting up our physics laboratories, and developing them into the finest possible. At present, Mr. Johnson teaches the advanced course of engineering physics and acts as adviser to the electrical engineers.

Mr. Johnson began his higher education at Illinois Wesleyan university from which he received his B.S. degree with a major in physics. Graduating in the class of '40, he studied later at Northwestern university and the University of Iowa. While attending Iowa he was a staff member of a weekly student publication.

Mr. Johnson then accepted a position with the Anthony company, which is one of the greatest producers of hydraulic hoists and truck bodies. Acting as co-director of research at Anthony, he was instrumental in developing a welding timer which is produced in numbers, and is used by that company in their many welding processes. In this position he led in the establishment of monthly tests, whereby samples of the individual worker's products are tested for the many stresses and strains to which they will be subjected, in order to insure a consistent high quality in the finished welds.

After completing three years of work for the Anthony company, Mr. Johnson worked at the Dodge plant in Chicago as a chemical spectrographer. In this capacity he tested incoming materials for the relative content of the many special metals and alloys which had to meet strict specification. This process involves burning a sample of material by a very high ampere spark, or arc, which produces light waves. The resulting arc is filtered through lenses and prisms. The identifying bands of color, and their density, allows very accurate

(Continued on page 26)

In This Corner... NAVY PIER

PIER PERSONALITY

By John Fijolek, E.E. '51

One of the functions of a university is the expansion of the frontiers of human knowledge. How best to perform this task has been the problem of educators of every age. It is only by imparting to each generation all that experience, research, and thought, gleaned by the old generation, that a stepping stone is provided for the younger. Our educators, in many cases, have slipped into a groove in being satisfied to merely impart, and make available, all that is known, and in trusting to latent human inquisitiveness, ambition, and desire to provide the stimuli for further activity on the part of the student.

There are some educators, though, that use cajolery, flattery, and other psychological tools to keep students alert and to transmit their store of information surely and effectively. If, in walking down the corridors of Navy Pier, you see a class of students trying to answer the question, "Why do you want to be an engineer?" then you know Mr. Feinstein is waking up his class.

Room 105 has been Mr. Feinstein's Navy Pier home for many a lesson, and as he has told his classes on occasion, "They always assign me to this room, and I always scuff my shoes on this nail protruding from this platform. Some day I'll bring my own hammer and nail it down myself."

You'll learn a lot more than just mathematics in his class, and you'll be faced with many questions outside of the assigned text. The unstated latitude and longitude of Chicago may be an additional hazard in a trigonometry problem. "How do you know the author is right? Did you check it?" may be other questions to upset the calm of the average student. Habit and accepted solutions are not holy ground in his classrooms.

Irwin K. Feinstein, as you may have surmised, has his own ideas on education. He describes himself as a fanatic on general education and states that his passionate interests are the training of student growth and the teaching of mathematics. That it is not a home hobby of his is evident in his classroom teaching and his representation of the mathematics department as a member of the general education committee —an advisory body on the problems of education to the associate dean of liberal arts at Navy Pier.

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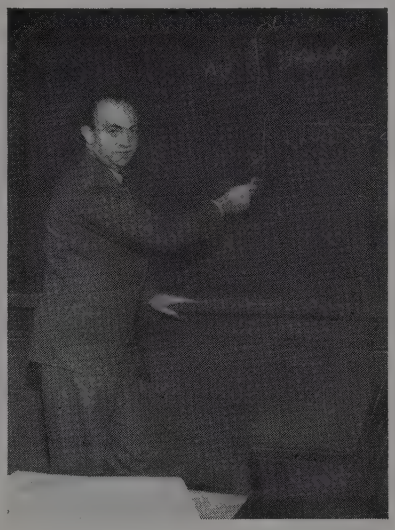
Mr. Feinstein is still single, received his B.S. at the Illinois Institute of Technology in 1936, graduated from Chicago Teachers' college in 1938 and obtained his M.A. at Northwestern university in 1946.He has taught physical education in the Chicago elementary schools and mathematics in the Chicago high schools, primarily at Steinmetz. He



MR. IRWIN K. FEINSTEIN

served four years in the Coast Guard during World War II, 36 months of which he spent at sea in the European-Mediterranean theater of operations, and also in a limited amount of Pacific duty.

Among his other achievements, he is co-author, with Messrs. Corliss and Levin of the Pier mathematics department, of the analytic geometry book now in use at the Pier, and which will be published in book form early in 1949. He is now working on a Ph.D. at Northwestern university.

He has a brisk mannerism about him and applies himself to his teaching. "Can you hear me?" in a loud voice; followed by, "Why don't you answer, then?" keeps more than one student awake. Or an informal vote of the class as to which answer is correct will bring forth, "Let's see, five say it's right, four say it's wrong, and we have 22 in the class. What happened to the rest of you?" Or, perhaps he'll say, "You make an 'A' in algebra, a 'B' in trigonometry, a 'C' in analytic geometry, and a 'D' in calculus, and you wonder why. It's just because you only memorize and don't think! Why do you want to be engineers and make only $22.50 a week?"

All this, however, is just added attraction to the prescribed curriculum and if you pass his course you've learned your mathematics. When the students talk about a mathematics instructor who is a little rugged but good, the odds are that they're talking about an interesting individual, Irwin K. Feinstein.

Let's Give a Helping Hand

By Siegmund Deutscher, A.E. '50

Yes, the Chicago undergraduate division of the University here at Navy Pier has grown. But have we, the students, grown with it? Of course, I am not referring to physical growth. I am aiming at our extra-curricular activities.

Since the beginning of this semester many students have approached me with questions such as "Whom do I see to join the A.S.M.E.?"; "When will the A.S.C.E. meet?" or, "Where does the A.I.E.E. meet?"

Whenever possible, I have tried to answer the questions. But, of course, some are outside the scope of my limited information. More so, many of the students do not know me or the few others that have information.

What is the solution to the above problem? I do not think that it is for me alone to decide. It is up to the combination of all the societies and organizations to solve. This could very easily be done if we had an Engineering Council.

Many times during the past and present semester, I have tried to get the officers of the organizations and societies together and establish an Engineering Council. At every approach I found enthusiasm, yet there has been no action.

This time, my appeal is in the form of this article. I propose that the officers

(Continued on Page 26)

The Engineering Honoraries and Societies

Bruce Brown, E.E. '52
Henry Kahn, Ch.E. '50
Jim Ephgrave, E.E. '51
Bill Soderstrum, Cer.E. '52

ENGINEERING COUNCIL

A bulletin board for the use of all engineering societies has been obtained by the Council, through the cooperation of Dean Enger.

At present, the societies have the use of one section of the glass-cased board outside the entrance to the Engineering library. If the single section should prove inadequate, additional space will be provided. The board is identified with the banner, "Student Engineering Societies."

This board, if full use is made of it, will do much to fill a long felt need for a means of letting all students know what the engineering societies on the campus are, what they are doing, and how to join them. It will provide a common link for informal business between the societies, and, for engineering students in general.

Additional information concerning the use of this bulletin board may be obtained from Bill Paulsen, secretary of the Engineering Council.

The open house committee reported at the October 21 meeting, that a willingness to cooperate on plans for an open house existed among the faculty.

Definite plans have been made to bring a well-known speaker to the campus on December 16. The talk is to have an engineering theme and will be given in the east ballroom of the Illini Union. All students are urged to attend.

The American Foundrymen's Society, installed officially at the University on October 21, petitioned for membership in the Engineering Council at the meeting held on October 28.

A.I.Ch.E.

The American Institute of Chemical Engineers was quite busy during the last month getting the chemical engineers oriented on possible future fields of specialization.

On November 3, 1948, the assistant research director of the Standard Oil laboratories at Whiting, Indiana, spoke on personnel problems that may be encountered by engineers. Two weeks later, on November 17, Dr. Sternberg of the United States Bureau of Mines at Louisiana, Missouri, spoke about synthetic fuel possibilities.

Tentative plans include among others, a talk on general problems encountered by chemical engineers in industry in December, and a dance in Club Commons in January.

A change in the organization was made in that Dr. J. W. Westwater has assumed the position of faculty adviser, which had been so ably filled by Dr. H. G. Drickamer during the last few years.

A.F.S.

The American Foundry Society is the student branch of the American Foundrymen's association. The first meeting of the year was held October 22 in Gregory Hall. Frank Shipley, of the Caterpillar Tractor company, conducted a panel on foundry practices and Robert Maloney, secretary-treasurer of the A.F.S., was present for the installation of officers.

The branch officers are Charles Drury, chairman; Harold French, vice-chairman; Robert Bales, secretary; and Joseph Davis, treasurer.

S.B.A.C.S.

The University of Illinois Student Branch of the American Ceramic Society has attained the largest membership in its history, with 102 active members. The program of the society has also reached new heights of activity with three events in the first complete month of school.

Approximately 60 watched the seniors battle the faculty and graduate students of the department of ceramic engineering to a 6 to 6 tie football game October 10 at Crystal Lake park in Urbana. After the hard-played game, a picnic supper of wieners, salad, and all of the trimmings was served by the students.

One of the most popular events at the Illini Union open house for the faculty October 16 was an exhibit of ceramic materials and products, prepared by the student branch. Four large tables of ware representing the glass, refractory, whiteware, porcelain enamel, abrasive, and structural clay products divisions were prepared by LaVoy Schneider, Jerome Schweitzer, Albert Siska, and Charles Curtis. They were assisted by Prof. A. W. Allen, Prof. G. F. Stockdale, graduate student W. D. Fitzpatrick, and L. R. McCraight, special research associate. Another table contained sample copies of the various journals and trade papers of the ceramic industry, along with copies of "Ceramics —What It Is—What It offers as a Career," which were distributed to many of the 1,500 guests at the party.

The student branch held its second regular meeting of the year Wednesday, October 20. The main speaker of the evening was Dean Howard Bowen of the College of Commerce. He gave a general outline of the economic system of the United States and where it is going. It was his opinion that business men must take a more active and open interest in the government. Dean Bowen told the group that the United States is the last outpost of free enterprise in the world, and it is up to us to demonstrate to the world how to make free enterprise work.

The student branch has entered two bowling teams in the Illini Union bowling tournament and plans the formation of other athletic teams to enter intramural competition.

ETA KAPPA NU

Come on all you electrical engineering geniuses, get out of your rut and see what's going on in the rest of the world. Eta Kappa Nu, the electrical engineering honorary, is giving a series of luncheons, one each month, followed with a lecture by a member of the University's non-engineering faculty. The first lecture this year was given by Dr. Goldman of the English department on the subject, "Engineering and Humanities." These luncheons are for the benefit of the actives, pledges, and alumni of Eta Kappa Nu.

About 75 electrical engineers are being pledged by Eta Kappa Nu this semester. Their initiation and a banquet will be held in Hotel Tilden Hall December 15.

S.A.E.

Are you tired of walking to school because your hot-rod eats up too much petrol? Is your car flat on its back in the garage? Tell you what you should do. Visit the meetings of the student branch of the Society of Automotive Engineers.

A good example of what one can do with stock cars was pointed out by Prof.

R. C. Juvinall at the October 29 meeting of the S.A.E. Mr. Juvinall revealed how he obtained the amazing rate of 50 miles per gallon from a stock car. That would have come in handy during gas rationing.

At that same meeting, R. C. Williams, chairman of the Central Illinois division of the Society of Automotive Engineers, also spoke to the group. He expressed the interest of the national society in the student branch. He also invited the student branch on an inspection trip of the Caterpillar Tractor company at Peoria sometime in the early part of December.

Don't get the idea that the S.A.E. is devoted entirely to automobiles. Its activities embrace standards, research projects, meetings, and publications. It fosters the exchange of engineering information in the fields represented by the 11 S.A.E. professional activity committees, which include among others: aircraft, diesel engines, passenger car production, tractors and farm machinery, transportation and maintenance, and trucks and busses. It is evident from this that the society is not limited to mechanical engineers.

Anyone interested in attending the inspection trip in December is urged to contact Bob Pontious, at 205 Mechanical Engineering laboratory.

SIGMA TAU

George Gore, the president of the local chapter of Sigma Tau, has returned from a national conclave of this all-engineering honorary and is again presiding in his official position. The conclave was held in Pittsburgh over October 7, 8, and 9 and was attended by members from all of Sigma Tau's widespread chapters.

The local chapter held its first formal meeting of the year on October 26 for the purpose of straightening out its business. At the next meeting plans for this year's social program will be discussed.

PI TAU SIGMA

Betty Lou Bailey had the honor of becoming the first woman member of Pi Tau Sigma at the pledging smoker October 19, 1948. Thus a 29-year-old precedent was broken. Professor H. J. Schrader, Associate Professor L. C. Pigage, and Assistant Professor J. L. Leach were invited to honorary memberships.

The highlight of the evening was a talk by Professor O. A. Leutwiler former head of the mechanical engineering department, who summarized the history of Pi Tau Sigma and spoke on the social and psychological aspects of engineering.

I.E.S.

"Kinda dark in here, ain't it? Let's call in an illuminating engineer." The best place to look for one is the I.E.S.

The Illuminating Engineers' club was formed last spring for the purpose of introducing to each other future illuminating engineers, the faculty members who deal in iluminating, and men in the illuminating industry.

Through the diligent efforts of Prof. John O. Kraehenbuehl, the Illuminating Engineers' club hopes to become the first student branch of the Illuminating Engineers' society sometime this month. This society is the national organization for those in the illuminating field.

Extensive programs for the coming year are to include such things as lectures on illuminating, and other lectures pertaining to illuminating such as "Psychology of Colors" and "State Engineering Exams." A number of demonstrations and movies will also be prominent on the programs. An open house for wives, freshmen, sophomores, and other guests has been planned for the near future, with lectures and demonstrations designed to gain the interest of the visitors.

The membership now stands at 50, with good prospects of a large increase in the near future. The officers for this year are Lowell Shepard, president; Stanley L. Burnham, vice-president; Robert E. Birr, secretary-treasurer; and Ralph Hintz, corresponding secretary.

At the first meeting of the I.E.S., which was held October 6, the program consisted of the lecture, "A Tour of Slides," a group of slides on outstanding lighting installations for 1947-48. This lecture was completed on the next meeting held October 27.

A.S.C.E.

Tote that slide rule! Lift that T-square! Another rugged semester has started for the engineers. The monotony of the constant studying can be broken for civil, architectural, and general engineers, however, by membership in the A.S.C.E.

The present membership of the American Society of Civil Engineers is up to the three hundred mark, the largest of any student branch. It looks like a a promising year for the A.S.C.E.

At the last meeting of the student branch, Prof. W. W. Hay of the civil engineering staff gave an interesting and informative talk on "Rehabilitation of the Alaskan Railway." Mr. Hay spent the summer in Alaska working on this project, and is exceptionally well qualified to speak on the subject. Approximately 200 students attended this meeting at which the faculty and all civil engineering students were guests.

M.I.S.

A meeting of the M. I. S. was held on October 8. Before 60 mining and metallurgical engineers, T. C. Shedd, professor of structural engineering, spoke on "Professional Engineering Examinations."

During the business portion of the meeting several committee chairmen were appointed. They are the first to serve in such a capacity in the history of the organization. Those appointed were Jim Stanley, arrangements; William Green, publicity; Norbert Blaski, Illio picture; Ben Tudor, picnic; and H. C. Turner, programs.

Plans for the meeting on December 8 include an address by George S. Mican, rolling superintendent of Carnegie-Illinois Steel company. He will speak on "Rolling Operations."

CHI EPSILON

Hey, you brains! Don't bury yourselves entirely in books! There are other phases of life than studying! You have been working diligently and are just short of a five-point average. So what! So you now can join one of the honorary fraternities. For civil engineers the Chi Epsilon fraternity rates pretty high.

Requirements for Chi Epsilon consist of a high scholastic average and, as is the case with all fraternities, a good personality. This year Chi Epsilon started off with 25 members. Tuesday evening, October 12, they entertained 38 pledges at a smoker given at the YMCA. These pledges will be initiated sometime in December.

The officers this year are George Roberts, president; Dominic Principeli, vice-president; Dean Collins, secretary; and Richard Foley, corresponding secretary.

GAMMA ALPHA RHO

Friday night, September 30, Delta chapter of Gamma Alpha Rho, newly formed aeronautical engineering honorary society, held a smoker at the Illini Union. The purpose of the meeting was to acquaint eligible aeronautical engineering students with Gamma Alpha Rho.

The program consisted of short addresses given by Vernon Van Heyningen, president; William Brooks, vice-president; Frank Wohlmuth, treasurer; and Simon Sommer and Lowell Masley, initiation committee.

Gamma Alpha Rho is a recent newcomer to the ranks of the campus honoraries. The aeronautical engineering honorary was recognized by the University Senate April 30, 1948, and was declared Delta chapter of Gamma Alpha Rho May 3, 1948.

(Continued on page 44)

Introducing . . .

by Robert Lawrence, E. Physics '51

SAM J. PIAZZA

"Golly, I wish I were carrying a little more weight. I'd sure like to play some football in high school!" Every boy with athletic ability likes to dream of the day when he'll become one of the boys out there on the gridiron.

So it was with Sam Piazza from Chicago Heights, Illinois. He entered Bloom township high school in 1941 weighing 150 pounds. His greatest struggle with athletics concerned his weight; but with a strong will power and a desire to participate, he went out for three major sports. He was on all

SAM J. PIAZZA

varsity teams: football, baseball, and track. In 1945 he made "all state" in football.

Today we know Sam Piazza as "No. 54," playing halfback for "The Fighting Illini." He attains recognition as being the lightest member of the squad, tipping the scales at 160 pounds as compared to the squad average of over 190 pounds.

Sam is a quiet fellow and rather modest; he finds no time for hobbies on the college campus. We found him in his room at the Sigma Pi fraternity tackling a calculus assignment. He is enrolled in the College of Engineering, and is specializing as a civil construction engineer.

He has worked at several different jobs. During his high school days he worked in his father's meat market and grocery store. Following his graduation, he served 16 months in the quartermaster corps. At present, he spends his summers gaining practical experience by working with construction crews.

The dating ratio on the campus doesn't affect Sam because his girl, Eleanor Malizia, is back home at Chicago Heights. Sam and Eleanor reigned as king and queen at their high school homecoming festivities during Sam's senior year, and they have been dating regularly ever since.

Finding time for leisure, Sam works earnestly for his achievements. He strives to accomplish, and he accomplishes by striving.

WILLIAM L. HULL

The mechanical engineering students will soon be attending classes in their new building on the corner of Mathews and Green streets. They will conduct experiments in laboratories containing some of the most modern testing equipment available today.

The man responsible for most of the construction details and processing of the laboratory is William L. Hull, associate professor of mechanical engineering. His office is piled with various materials, waiting to be transferred to the new building.

Mr. Hull has proven to be a very capable man for handling such a project. He received his B.S. in mechanical engineering at the University of Colorado in 1934, and went to work for the Chrysler corporation as an experimental and development engineer. While with Chrysler, he attended the Chrysler Institute of Engineering and received his master's degree in automotive engineering. He left Chrysler corporation in 1937, and joined the mechanical engineering staff at Purdue university. While there, he instructed courses in heat and power, internal combustion engines, and thermodynamics. He also received his M.S. in mechanical engineering.

Mr. Hull's specialized interest is internal combustion engines; he broadened his knowledge by picking up practical experience during the summers.

In 1938 he worked for the Lockheed corporation; in 1939 he worked for the Allison division of General Motors; and in 1940 he took an assignment for Combs Aircraft corporation, Denver, Colorado, working under Prof. Norman A. Parker, the present head of our mechanical engineering department.

In 1940, Mr. Hull joined the staff of the University of Colorado, where he taught and did research work. There, too, he was under Mr. Parker, who was at that time head of the Colorado mechanical engineering department.

An interesting part of his research work covered an assignment for the U. S. Army air forces. This was a fuel

PROF. WILLIAM L. HULL

volatility performance project on an Allison engine, operating at low temperature conditions. Mr. Hull worked on this project from 1944 to 1945, producing satisfactory results, and presented a 900-page report to the air forces.

He followed Mr. Parker to Illinois in 1947 and is now instructing M.E. 6 and M.E. 7, along with his work on the new M.E. building.

Last year, Mr. Hull built a new home in west Champaign for his wife and two children. He has a little girl three years old and a boy seven years old.

He likes to bowl, play bridge and, when he has time, play "at" golf. He is certainly one busy man, being a member of Acacia social fraternity and four honoraries: Sigma Tau and Tau Beta Pi, engineering; Pi Tau Sigma, mechanical engineering, and Sigma Xi, research. He is also a member of the American Society of Engineering Education, and is the faculty adviser of the Society of Automotive Engineers.

Students who really know Mr. Hull say that he is "tops," because he enjoys his work and is so actively interested in his students. As one member of his class says, "He is a swell guy to know —and a great man to work with."

"Will this course help prepare me for a telephone job?"

"Yes, it will. And that would be true of almost any course you'd name.

"That's because varied abilities are required. The telephone system has mechanical engineers, electrical engineers, civil engineers, and so forth. Some are in development or research, and make contributions in these fields. More are in the operating end. They deal with economic as well as technical problems, handle personnel, and assume other responsibilities gained as their careers progress.

"In other words, telephony has many interesting jobs. To prepare for one of them, learn your particular branch of engineering and gain as much all-around knowledge as you can."

BELL TELEPHONE SYSTEM

EDWIN A. WITORT
Editor

•

PHILLIP B. DOLL
Assoc. Editor

the Illinois Technograph

Considering the Fish . . .

When you go fishing, how do you bait your hook? You may have a fondness for big, thick, juicy, sirloin steaks, but do you hang one of those on a hook and drop it in the water? Certainly not—a fish wouldn't flip his dorsal fin twice at blue-ribbon beef dangling in front of him. Instead, you consider the situation from the viewpoint of the fish.

Why not use the same reasoning in dealings with people?

In dealing with people, no matter who, where, or when, there are two prime considerations—getting along with people, and getting them to do what you want them to do. Either or both appear, from shooting the breeze between classes to rehabilitating Europe. The only person who can ignore them is a prisoner in solitary confinement.

In this civilization of the Atomic Age, of accelerated living, mass production, and ulcers, the ability to get along with people and get them to do what you want them to do is of increasing importance. Friendships have become "contacts"; the friendships of yesteryear have today become a few close friends and many contacts. More and different people are encountered every day, and some system is necessary to get along with these people and influence their activities. At the same time, this must be done so as to leave a mental attitude conducive to further agreeable relations and cooperation.

The engineer should be vitally concerned with these considerations, whether he is in design, management, production, sales, research, or some other of the multitudinous phases of engineering. The big problems are not solved by one harassed man working in a dimly-lighted garret. Rather, they are solved by an organization, working in close cooperation and harmony. The days of kitchen table chemistry and make-shift apparatus are over. The talk now is of electronic calculators and pilot plants. Gone are the charcoal forge and anvil; enter the automatic screw machine and quality control. Getting along with people and directing their activities is a vital part of this program.

How are we going to find a method to accomplish this? It's simple. It's so absurdly simple that too few people even think about it, let alone practice it. It consists merely of a mental attitude; consider the other person. You consider the likes and dislikes of a fish. Why not amplify this to include your fellowman?

Henry Ford knew this. He said, "If there is any one secret of success, it lies in the ability to get the other person's point of view and see things from his angle as well as our own." This should be posted at the gate of every plant, cast into the base of every Alma Mater statue, carved into the tables of the United Nations, and printed on the back of every vehicle tax sticker.

Talk to the other fellow in terms of his interests and desires, and he will listen all day. Of course, this must be administered with care and insight, for often what appears on the surface is far from the whole story. There are, in general, two reasons for doing something—the reason that sounds good, and the real reason. The real reason can usually be traced right back in terms of personal interests and desires.

Call it "practical psychology," "the technique of handling people," or what you will. One grain of it is more valuable than a ton of advanced theory and application. For, unlike the latter, the ability to get along with people and get them to do what you want them to do is not something to be absorbed by a few geniuses; it is a necessity for modern living.

REQUIRED READING FOR ALUMNI

WHEN YOU GRADUATE, your faithful slip-stick will go with you—required reading throughout your working years. You'll take some of your textbooks with you, too, to help you go places in business. Many of these will undoubtedly bear the McGraw-Hill name—since McGraw-Hill is headquarters for technical information.

To your reference shelf of reliable McGraw-Hill books, add the McGraw-Hill magazine devoted to your particular field.

For example, if you're studying to be an electrical engineer, you probably know Terman's Radio Engineers' Handbook, Henny's Radio Engineering Handbook or Knowlton's Standard Handbook for Electrical Engineers. If you're going to be a mechanical engineer, it's very likely that you've used Marks' Mechanical Engineers' Handbook and other McGraw-Hill books in this field.

When you're launched on your engineering career, get to know *your* McGraw-Hill magazine—such as Electronics, Electrical World, Electrical Construction & Maintenance, American Machinist, or Power.

McGraw-Hill books and magazines cover practically every conceivable phase of business and industry. They'll help you do a better job.

McGRAW-HILL
PUBLICATIONS

HEADQUARTERS FOR TECHNICAL INFORMATION

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VOCABULARY CLINIC

Do you know that the position YOU will have in years to come will, to a great extent, depend upon YOUR vocabulary? Yes, your vocabulary will be a veritable measure of your success. It has been proven time and time again that one of the most common traits among men of success in any professional field whatsoever is a large, useable, functioning vocabulary.

Realization of the importance of these facts should spur any man into action. To acquire a large vocabulary is not difficult; but it does take time and practice.

The TECHNOGRAPH will endeavor to assist its readers to enlarge their vocabularies by publishing a short vocabulary quiz in this and the remaining issues of this year. The words in this quiz, as well as the words appearing in subsequent quizzes, will not be selected haphazardly from a dictionary, but rather, they will be choice words that are used every day by successful professional men.

1. Ineffable—(a) unable, (b) witty, (c) not alive, (d) unutterable
2. Flatulent—(a) pretentious, (b) not carbonized, (c) insane, (d) terrible
3. Exigent—(a) leading out, (b) in urgent need, (c) afraid, (d) polite
4. Efficacious—(a) effective, (b) reluctant, (c) easy, (d) unconquerable
5. Cogent—(a) abusive, (b) convincing, (c) aware, (d) unaware
6. Collusive—(a) deceitful, (b) sticking together, (c) tender, (d) inquisitive
7. Panacea—(a) a waffle, (b) a remedy to cure all ills, (c) reason, (d) an alloy
8. Enervating—(a) detestable, (b) deceiving, (c) trespassing, (d) weakening
9. Didactic—(a) a diaper, (b) teacher-like, (c) exact opposite, (d) idiotic
10. Palaver—(a) a corpse, (b) empty talk, (c) pastry, (d) a myth
11. Penchant—(a) a strong inclination, (b) loud talk, (c) comfort, (d) harsh
12. Prowess—(a) frustrate, (b) prominence, (c) superior ability, (d) forgetfulness
13. Bromidic—(a) common-place, (b) a cure for headaches, (c) like bromide, (d) toxic
14. Captious—(a) captivating, (b) hard to please, (c) spicy, (d) esteemed
15. Supine—(a) attractive, (b) tasty, (c) having no interest or care, (d) penniless

As an added note: When you finish the quiz, in order to make yourself more familiar with these words, make sure you know the correction pronunciation and are able to use each of them in a sentence. Then, and only then, will you be able to claim these words as a part of your vocabulary. Answers will be found on page 32.

"How did you find the ladies at the dance?"

"Opened the door marked 'Ladies' and there they were."

* * *

"I'll never take another drop," said the drunk as he fell off the sky-scraper.

* * *

M.E. 1 — "How is ol' Bill these days?"

M.E. 2 — "Oh, he's much better since his operation!"

M.E. 1 — "What operation?"

M.E. 2 — "Haven't you heard? They removed a brass rail that was pressing against his foot for years."

* * *

Mother: "Martin, every time you are naughty, I get another gray hair."

Martin: "Gee, mamma, you must have been a terror when you were young. Just look at grandma."

AN OKONITE "TWIST" ON CABLE TESTING

Okonite research includes subjecting short lengths of electrical cable to torsion tests (pictured above), twisting them through a spiral arc of 180° under a heavy load.

Bending tests, impact tests, tests of wear-resistance by abrasion — these are a few of the mechanical tests which, along with electrical, chemical and weather-exposure tests, complete an integrated program of performance checks. From its results comes information which Okonite engineers translate again and again into wire and cable improvements that mark major advances in the field. The Okonite Company, Passaic, New Jersey.

5171

OKONITE SINCE 1878

insulated wires and cables

Christmas Greetings

from

MURPHY'S

MEN'S CLOTHIERS

"The Home of Society Brand Clothes"

27 Main On the Corner

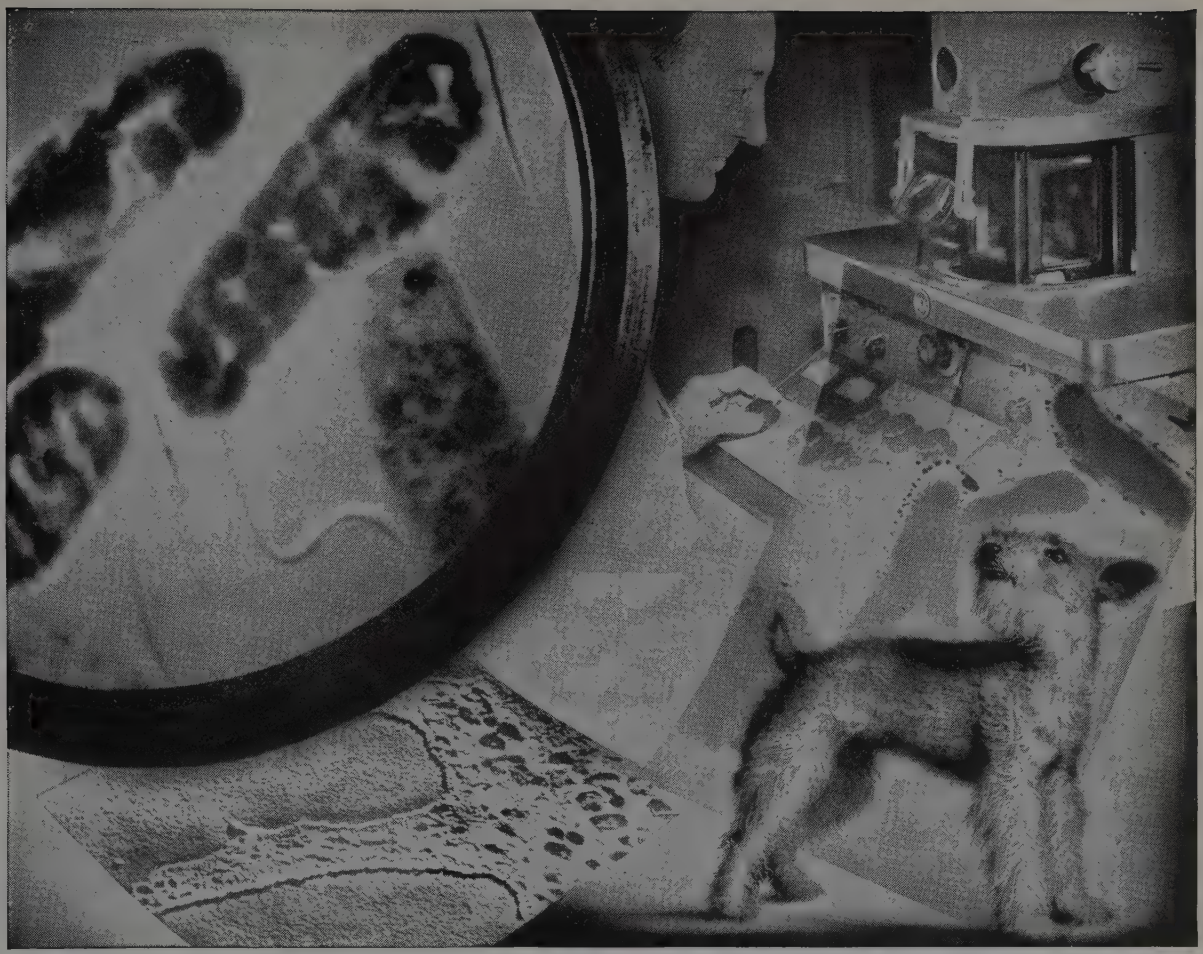
CHAMPAIGN

Automobiles

What every engineer should know about them

• •

Read it in the January issue of the TECHNOGRAPH



Electron microscope, perfected at RCA Laboratories, reveals hitherto hidden facts about the structure of bacteria.

Bacteria bigger than a Terrier

Once scientists, exploring the invisible, worked relatively "blind." Few microscopes magnified more than 1500 diameters. Many bacteria, and almost all viruses, remained invisible.

Then RCA scientists opened new windows into a hidden world—with the first commercially practical electron microscope. In the laboratory this instrument has reached magnifications of 200,000 diameters and over. 100,000 is commonplace . . .

To understand such figures, picture this: A man magnified 200,000 times could lie with his head in Washington, D. C., and his feet in New York. . . . A hair similarly magnified would appear as large as the Washington Monument.

Scientists not only see bacteria, but also viruses—and have even photographed a molecule! Specialists in other fields—such as industry, mining, agriculture, forestry—have learned unsuspected truths about natural resources.

Development of the electron microscope as a practical tool of science, medicine, and industry is another example of RCA research at work. This leadership is part of all instruments bearing the names RCA, and RCA Victor.

• • •

When in Radio City, New York, be sure to see the radio, television and electronic wonders at RCA Exhibition Hall, 36 West 49th Street. Free admission. Radio Corporation of America, RCA Building, Radio City, N. Y. 20.

Continue your education with pay—at RCA

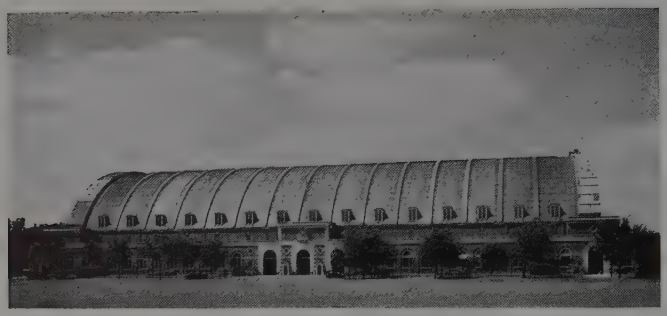
Graduate Electrical Engineers: RCA Victor—one of the world's foremost manufacturers of radio and electronic products—offers you opportunity to gain valuable, well-rounded training and experience at a good salary with opportunities for advancement. Here are only five of the many projects which offer unusual promise:

- Development and design of radio receivers (including broadcast, short wave and FM circuits, television, and phonograph combinations).
- Advanced development and design of AM and FM broadcast transmitters, R-F induction heating, mobile communications equipment, relay systems.
- Design of component parts such as coils, loudspeakers, capacitors.
- Development and design of new recording and producing methods.
- Design of receiving, power, cathode ray, gas and photo tubes.

Write today to National Recruiting Division, RCA Victor, Camden, New Jersey.

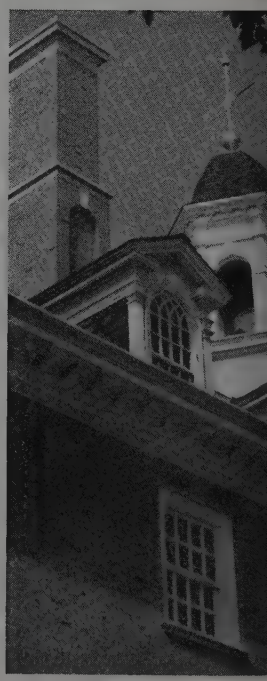
Also many opportunities for Mechanical and Chemical Engineers and Physicists.

RCA **RADIO CORPORATION of AMERICA**



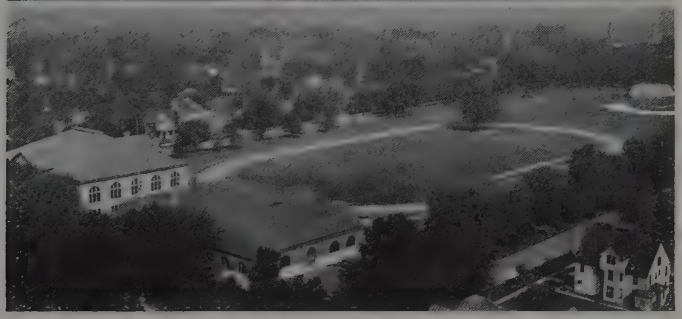
Scenes A

Upper left—Universit
Mater statue. Low
Building. Upper r
center—Athletic field
—Engineering Hall.



nd Campus

y. Lower left—the Alma
r—cupola of the Union
morial Stadium. Right
Old gym. Lower right



GALESBURG . . .

(Continued from page 14)

tabulation of the quantity of material present in the product.

During the war, Mr. Johonson taught at Ripon college, in Wisconsin. He was one of the many teachers who did excellent service to our country by teaching during the day and working at a local war plant in the evening. Mr. Johnson taught for two and a half years at Ripon and then entered the Navy as a radio technician. After discharge from the Navy, he came directly to the Galesburg undergraduate division, and since, has established himself as an able instructor and a willing counselor.

Freshman Orientation Program

By H. Roy Johnson, C.E. '51

The prospective engineer faces many problems, some of which can be eliminated by proper counseling and instruction. To supplement the individual counseling service now in operation here on the Galesburg campus, a program of freshman orientation has been successfully undertaken.

Such prominent men as Dean Jordan, associate dean of engineering at the University of Illinois; Dr. Carter, head of the department of student welfare here at Galesburg; and Dr. Aherns, chairman of the college of education at the Galesburg division, have highlighted this program, which is sponsored by the Engineering Sciences division, under the guidance of Prof. F. W. Trezise.

Not entirely new in the history of education, this program, which familiarizes the freshman engineer with college life in general, has been in operation in many of the most prominent schools in the nation.

This course, which is non-credit, and meets only once a week for a one-hour period, has been enthusiastically received by the freshmen engineers. Movies, illustrating the use of the slide rule, have already appeared on the program, and a course in the instruction of this instrument is now being arranged because of the aforementioned enthusiasm.

Such a course, which advises the new student as to the proper methods of study and concentration, enables him to pursue his vocation in a more orderly and consolidated manner. By the pursuance of such a program, the future of our youth, and therefore the future of our nation, is assured.

Soph: "Why don't you major in pharmacy?"

Dumb Frosh: "Oh, no. I couldn't think of living on a farm all my life."

NAVY PIER . . .

(Continued from page 15)

of all the engineering societies and organizations meet in our common office, Room 354-I, on Monday, December 20, at 5 p. m. and form into an active council.

We have in our possession at this time, a copy of the Urbana Engineering Council constitution and some of their past meetings minutes.

The foundation has already been laid —*let's give a helping hand.*

"And what do you do with your old razor blades?" questioned Sam.

"Try to shave with them," replied Joe.

* * *

Definition: research—a blind man in a dark room hunting for a black cat that isn't there.

* * *

A laborer doing a hauling job was informed that he could not get his money until he submitted a statement. After much meditation he evolved the following bill: "Three comes and three goes at four bits a went—$3."

* * *

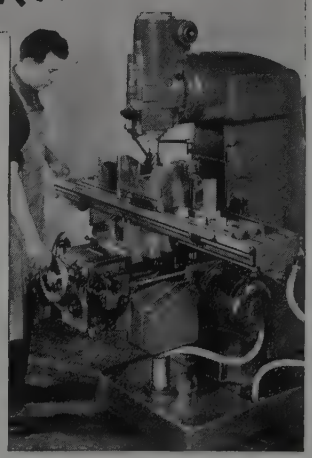
20th Century Version

George Washington: "Father, I cannot tell a lie. I cut your sherry."

for QUICK EASY OPERATION

No. 2 VERTICAL MILLING MACHINE

LIGHT TYPE



On the job shown above the work is quickly positioned for cutting several adjacent surfaces.

The Brown & Sharpe Light Type design provides a light sensitive milling machine that permits ease and rapidity of handling—yet insures the high degree of accuracy necessary of a milling machine for toolroom or general purpose work. Smooth working controls and mechanisms give faster operation with less effort and fatigue. Convenient control grouping and the swivelling spindle head give the machine outstanding efficiency for both set-up and operation. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.

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DU PONT Digest
For Students of Science and Engineering

Science paints the future

41 of every 1,000 U. S. chemists are engaged in production of paints, lacquers, varnishes and colors

Modern paint making is an outstanding example of chemistry at work—of the way the scientific approach has replaced rule-of-thumb methods.

Today, paints are formulated by chemists to meet specific needs. In their search for better finishes, these highly trained technical men are aided by the electron microscope and infrared spectroscope. A variety of gonio-

Rust would quickly weaken *this structure. Because "Dulux" resists salt water and salt air, it has for years protected many famous bridges.*

photometric and spectrophotometric devices are used by the physicist and physical chemist in the study of gloss and color.

Du Pont men have produced many superior finishes. One of them, "Dulux" nitrocellulose lacquer, made mass production of automobiles possible by shortening paint drying time from weeks to hours.

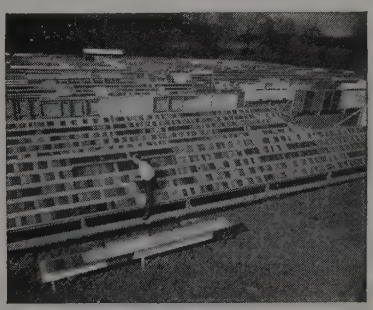
Finish failures—chipping and scratching—were costing manufacturers of home refrigerators a million dollars a year before Du Pont chemists developed "Dulux" synthetic resin enamels, based on alkyd resins. A "Dulux" coating on metal or wood dries into a film that even a hammer blow won't break. Tests with mechanical scrubbers prove it outwears old-style enamels by more than five times. "Dulux" enamels now guard boats, large and small, as well as petroleum tank farms, machinery and other industrial installations.

At Du Pont's paint laboratories, a wide range of materials is under study. Where the colloid chemist, the physical and organic chemist, the analyst, physicist and other technically trained men leave off, the chemical engineer, mechanical engineer and metallurgist stand ready to design equipment to make better commercial production possible.

Modern equipment speeds research

Many of today's research tools are complex and expensive. The modern research worker may use a $30,000

Satin-smooth beauty *and outstanding durability are properties given by "Duco" or "Dulux" to furniture, trucks, buses and trains.*



Paints are tested *by exposure to weather at paint "farms." Research men interpret results as guide for development of improved paints.*

Mark P. Morse, *B. S., Physics, Washington College '40, measures specular and diffused reflection of a sample paint surface with a goniophotometer, a Du Pont development for obtaining data on gloss and brightness.*

mass spectrometer installation which can make an analysis in three hours that formerly took three months. High pressure equipment, ultra centrifuges, molecular stills, and complete reference libraries are other tools which speed research and enlarge its scope.

Young scientists joining the Du Pont organization have at their disposal the finest equipment available. Moreover they enjoy the stimulation of working with some of the most able scientists in their fields, in groups small enough to bring about quick recognition of individual talent and capabilities. They find here the opportunity, cooperation and friendly encouragement they need. Thus they can do their best work, both for the organization and themselves.

Send for your free copy of this new booklet

The 40-page, fully illustrated brochure, "The Du Pont Company and the College Graduate," answers your questions about opportunities at Du Pont. Describes openings in research, production, sales and many other fields. Explains the plan of organization whereby individual ability is recognized and rewarded. Write today. Address: 2518 Nemours Building, Wilmington 98, Delaware.

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WHAT'S IN A NAME . . .

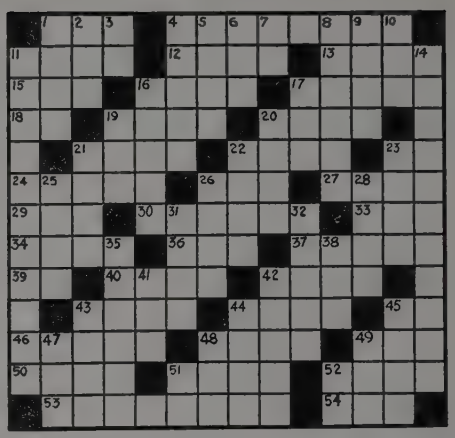
(Continued from page 7)

There is an excellent chance that he will make his mark in the world after losing his first three jobs due to incompatibility. You will be doing him a great favor if you give him the first one."

"Mr. Chip Shoulder is one of the most unpleasant young men that I have ever encountered. He is practically illiterate, argumentative, and has an excellent opinion of himself in direct contrast to his ability. In behalf of the university, and with the full concurrence of my fellow teachers, I apologize for his degree (cc. to C. S.)"

In summary, and all kidding aside, there is a way of making people want to write a letter of recommendation. First, if possible, get a reputation for scholarship. Second, enter into some useful extra-curricular activity. The exact balance is up to the student, but both are necessary. Even the "C" student will get his boost if he gets into some worthwhile project and does a good job which can be measured in results and not in wind. A student who feels that he enjoys the confidence of his teachers should not hesitate to ask for the privilege of using their names, remembering that as old Will Shakespeare so aptly put it, "—he who filches from me my good name takes that which enriches him not and makes me poor indeed."

Crossword Puzzle



ACROSS

1. Grassy field
4. Englishman who was first to read by electric light, 1709
11. Laid the first submarine cable, New York Harbor, 1843
12. Iridescent gem stone
13. Heedless
15. Lightning protector
16. Rumple
17. Lariat
18. To a higher level
19. Foundation
20. Insinuate
21. Have courage to
22. Food for furnaces
23. Hush!
24. Published details of his zinc mercury cell in 1873
26. Heavy weight
27. Dark evergreen trees
29. Relatives
30. Invented the automatic electric toaster, 1919
33. Destructive rodent
34. Break suddenly
36. Fish that generates electricity
37. Heavenly food
39. That man
40. Devised his discharging-jar electrometer, 1767
42. Anatomical network
43. Support for an antenna
44. Small, timid animal
45. Holy person: abbr.
46. Middays
48. Developed a crude arc lamp in 1808
49. Popular American dessert
50. German philosopher
51. Part in a play
52. Discovered the electro-optical effect in diaelectrics, 1875
53. Discovered X-rays in 1895
54. Turn to the right

DOWN

1. Highly directional form of antenna
2. Old age: poetic
3. Near
4. Patented the first practical printing telegraph system in 1846
5. Part of a church
6. Existed
7. 1,000 liters: abbr.
8. Invented the "conerer" or wireless detector, 1885
9. Orient
10. S-shaped worm
11. His researches led to the process of electroplating
14. Patented electrostatically shielded cable, 1916
16. Designed an enclosed arc light in 1893
17. Be situated
19. Legal profession
20. A search
21. Developed a vertical bar magnet in 1827
22. Thin metal sheet
23. Developed the all-glass electric light bulb in 1879
25. Cover the inside of
26. Large plant
28. Sea eagle
31. Canvas shelter
32. Corundum used for grinding, etc.
35. Designed a lead-plate storage battery in 1859
38. Devoured
41. Simpleton
42. Black crowlike bird
43. Single: prefix
44. In good health
45. Father
47. Rowing device
48. Fastening device
49. Part of an anchor
51. Football position: abbr.
52. 1,000 grams: abbr.

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Look How Alcoa Aluminum Extrusions Have Helped Our Prophecy Come True!

On June 21, 1930, this advertisement appeared in one of America's great national magazines. "Aha!" chortled a lot of people. "Look at Alcoa sticking its neck out!"

Now, in 1948, there are many aluminum trains to ride. In the past three years alone, 450 passenger cars have been ordered in Alcoa Aluminum. 103 freight cars. 412 tank cars.

One reason for the railroads' swing to Alcoa Aluminum is typified by the big extrusion press shown above. Squeezing out intricate aluminum shapes like toothpaste from a tube, it permits big assembly savings in car structures . . . without sacrifice of strength. From the massive but lightweight beam, 80 feet long, that serves as a car side sill, down to the satiny fluted moldings around the windows, Alcoa Aluminum Extrusions find wide use.

Getting metal where it's wanted, in the most intricate of shapes, and in gleaming, lightweight, corrosion-resistant Alcoa Aluminum—these advantages have helped many an industry to production short cuts, better products.

The story of aluminum is still being written. New developments are in the making that promise as much for the future of aluminum as the promise we made about aluminum trains back in 1930. ALUMINUM COMPANY OF AMERICA, Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM 1888 1948 60 YEARS OF SERVICE

Alcoa ran the advertisement above before being able to make big aluminum beams for railroad cars—in fact, before the railroads even showed much interest in aluminum. Believing the idea was sound, Alcoa took a chance, built costly machinery to make beams, then went out and sold them. *Result:* these days you *do* ride on aluminum trains. This is typical of the history of Alcoa. In 60 short years, Alcoa Aluminum has found its way into thousands of useful things: utensils that cook better, buildings that last longer, planes that fly faster. But this is only the beginning. New developments, now in the laboratory stage, are pointing the way to even wider uses for aluminum tomorrow.

TRIANGLE . . .

(Continued from page 9)

courages harder study and better grades by serving as a constant reminder of the importance of scholarship.

High scholarship alone does not necessarily insure that a person will be either a good engineer or a good citizen, and Triangle recognizes this fact. Triangle is definitely a social, as well as a professional fraternity, and members are encouraged to take part in its various functions. Participation in intramural events is limited by the fact that the fraternity has fewer than 20 actives, but Triangle does have basketball and bowling teams, and enters into the sports requiring small teams.

Extra-curricular student activities are recognized as an asset both to the persons participating and to the school, so members are also encouraged to work on any activity on which they have a true interest. It is a policy of Triangle, however, not to force members into such work merely for the sake of participation, so no one is asked to work on an activity unless they wish to do so.

While Triangle limits its membership to engineers and architects, it does not limit it to undergraduates. Graduate students, professors, and outstanding men in the engineering field are eligible for election as national honorary members, or as honorary members of an individual chapter. Such men as Daniel W. Mead, authority on hydraulics, formerly at the University of Wisconsin, and Arthur N. Talbot, for whom Talbot laboratory is named, are indicative of the type of person elected to the former status. M. L. Enger, dean of the engineering college, A. C. Willard, president emeritus of the University of Illinois, H. H. Jordan, associate dean of the College of Engineering, and A. R. Knight, professor of electrical engineering, are some of the several men elected by this chapter as honorary members. The latest initiate is W. L. Everitt, head of the electrical engineering department here, and recently named dean-elect of the engineering college. The two faculty advisers to the Illinois chapter, R. S. Crossman and L. D. Walker, are alumni members.

Triangle is much more than a group of persons who eat, sleep, and live engineering. It is an active social fraternity which has combined many of the features of professional and honorary fraternities. It is firmly rooted at Illinois and elsewhere, and should remain as long as engineers and engineering students remain.

Then again, maybe the professor who sent his wife to the bank and kissed his money goodbye wasn't so absent-minded after all.

I.A.S.

The aero's announce some great things in store for all aeronautical engineers, and especially for those who belong to the I.A.S.

In the spring, the aeronautical engineering department will take over the greater part of the first floor of the Transportation building and will replace railway motifs with aviation displays, including scale models of airplanes. A model airplane meet and the I.A.S. regional convention are also planned.

The highlights of the meeting on October 14, 1948, were a technical movie titled, "Martin PBM-3 Static Wing Test" and comments on the film by Prof. John M. Coan, who worked on similar projects prior to the recent war.

"Are you going to take this lying down?" boomed the candidate.

"Of course not," said a voice from the rear of the hall, "the reporters are doing that."

* * *

'Twas midnight in the parlor
'Twas darkness everywhere;
The silence was unbroken—
There was nobody there.

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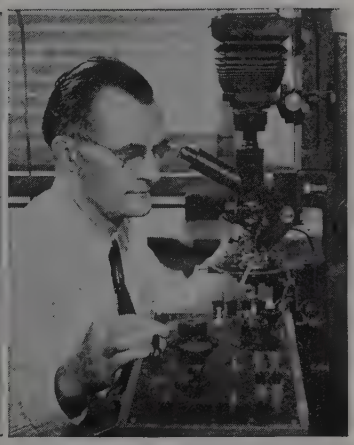
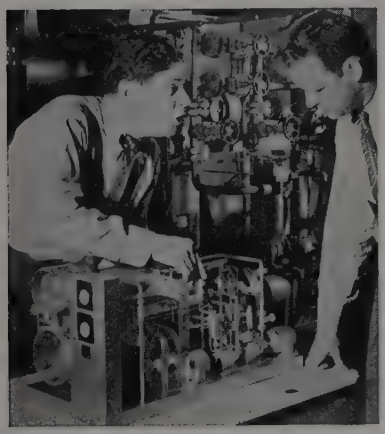
How chemists develop new edible oils . . . and engineers follow through to produce them



1. Chemists conduct microscopic studies on glycerides . . . to develop new edible oils.

2. Chemical Engineers carry on hydrogenation experiments to improve processing procedures.



3. Mechanical Engineers design full-scale factory equipment, using scale models like this edible oil freezer.

4. Other Engineers plan and supervise production operations.

This is just one example of P & G Technical Teamwork in action; similar developments in other fields call for additional men with technical training. That's why P & G representatives periodically visit the country's top technical schools to interview students. If you would like to talk to a Procter & Gamble representative, ask your faculty adviser or placement bureau to arrange a meeting.

PROCTER & GAMBLE

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DETECTED BY SOUND . . .

(Continued from page 13)

in the oscilloscope, and voltage readings are taken with the vacuum tube voltmeter. A much higher voltage is read at the instant when the gas is subjected to radiation than when the shutter prevents exposure of the gas to infra-red.

Carbon dioxide-water mixtures seem to absorb more radiation than other gas mixtures used in the interferometer. The infra-red coupling effect in these mixtures exhibits markedly different characteristics depending on the water vapor concentration. This is easily understood in view of the fact that water vapor has a number of strongly absorbing bands in the infra-red region of the spectrum.

The distance between the driver and detector crystals is adjusted to be some multiple of the wave length of the supersonic vibration. When this distance is ten wave lengths, the energy of the sound wave is decreased by a factor of 16 at the time of maximum radiation absorption. This means that the detector crystal receives alternately large and small amounts of energy.

Two distinct types of coupling take place between the infra-red radiation and the supersonically excited gas. The simpler, due to periodic heating of the gas by radiation, has relatively slow response. When the gas is irradiated with infra-red, the rising temperature of the gas causes a changing velocity of sound, and consequently, a corresponding shift in wave length of the supersonic vibrations. The shift of wave length is proportional to small temperature changes. The time lag in heating the gas column, however, causes a decrease in the effect of this coupling at fast shutter speeds.

A second type of coupling, present at all shutter frequencies, deals with a change in the absorption coefficient of the gas molecules. Radiation changes the number of molecules in states associated with high acoustic absorption. The modulation amplitude (effect of radiation on the supersonic field) remains fairly constant despite varying shutter speeds. Very rapid response detectors for use in the far infra-red regions are made possible by this second type of radiation effect, as there is an infinitesimal time lag in the coupling action.

This may mean that detection of airplanes by the heat of their exhaust gases will actually be feasible. Anti-aircraft gunners of the future may use the slogan, "Where there's smoke, fire!"

The slogan for a night's entertainment: So-fa and no-father.

Quick, Doctor, do something! I was playing a harmonica and swallowed it.

Keep calm, sir, and be thankful you were not playing the piano.

* * *

She: "I ought to leave you and go home to mother."

He (angrily): "Well, why don't you?"

She: "I can't. She's left father and is coming here."

* * *

A pedestrian is a case of survival of the flittest.

Answers to Vocabulary Quiz

1. d, 2. a, 3. b, 4. a, 5. b, 6. a, 7. b, 8. d, 9. b, 10. b, 11. a, 12. c, 13. a, 14. b, 15. c.

Crossword Answer

Punch Press equipped with LITTELL Dial Feed and LITTELL Safety Stop.

LITTELL DIAL FEEDS are especially efficient for high speed assembly work on punch presses. Press can be operated at from 40 to 80 strokes per minute, depending upon size of work pieces. Production will run from 15,000 to 20,000 pieces for an eight hour day. *Littell Dial Feeds* are also adapted for certain second operation work, such as perforating shells.

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There's nitrogen, for example, that protects the flavor and nutritional values of packaged foods. It is also used to protect delicate foods . . . butter and vegetable oils . . . keeping them sweet and free from undesirable odors.

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Stainless steel, too, easily cleaned and sterilized, gives us spoilage-free tanks, vats, hoppers, filters and great kettles that help prepare and process food for our use.

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WELDING . . .

(Continued from page 11)

sibility of incomplete diffusion due to variations in the material. The use of the normalize will tend to increase homogeneity where the same is lacking. However, any subsequent heat treatment must be predicated upon a full knowledge of the crystalline structure that is present or else there is the danger of grain growth and oversized grains.

The weld material showed as good ductility as did the parent metal while the endurance limit was greater than that of the original metal. There has been no definite explanation of this phenomenon but it is speculated that the effect is due to the orientation of the newly formed crystals in the former boundary area. The conclusion then, that can be made, is that the weld is not the limiting factor in the selection of the material to be used on a particular job.

Of the other physical properties, the yield point was slightly higher for the weld, but the ultimate remained very closely in agreement with the original value. The hardness of the weld was only slightly greater, and the use of the normalize treatment eliminated this difference within the range of practicability.

What are the problems which face the industrial user of the solid-phase welding process? There are several which are important but not insurmountable obstacles. The greatest problem is providing a means of establishing and maintaining a constant pressure between the pieces to be welded. The question of heating the zones of the metal immediately adjacent to the interface uniformly and equally becomes more difficult as the sizes of the pieces become greater. This is definitely a production process in that the initial investment is a high one and as yet not too flexible a procedure has been developed.

The process has been used successfully in the welding of medium sized pressure vessels, tie rods, and other such items where quantity production is the immediate objective.

In conclusion, a summation is in order. It has been shown that the liquid-phase welding methods possess some certain inherent difficulties which are not obtained in the solid-phase methods. The solid-phase method has been shown to be a workable one and a good one in so far as the physical properties of the metal are concerned. The great problem of the future, in solid-phase work, will be the experimentation with the many and varied possible combinations of metals that may possibly be joined through the medium of pressure, temperature, and time, without resort to a liquid phase.

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(4) "A Few Observations on Solid-Phase Bonding" by G. Durst, Metal Progress, Vol. 51, Jan. 1947, pp. 97-101.

Two farmers met on a country road, and pulled up their teams.

"Si," said Josh, "I've got a mule with distemper, What did you give that one of yours when he had it?"

"Turpentine. Giddap!"

A week later they met again.

"Say, Si, gave my mule turpentine, and it killed him."

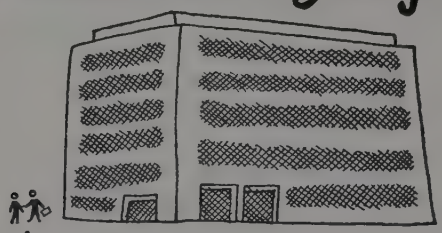
"Killed mine, too. Giddap!"

* * *

"I can't imagine what we ever got married for; we're totally different in every way."

"Oh, you flatterer."

No matter how big the job-



or how small-

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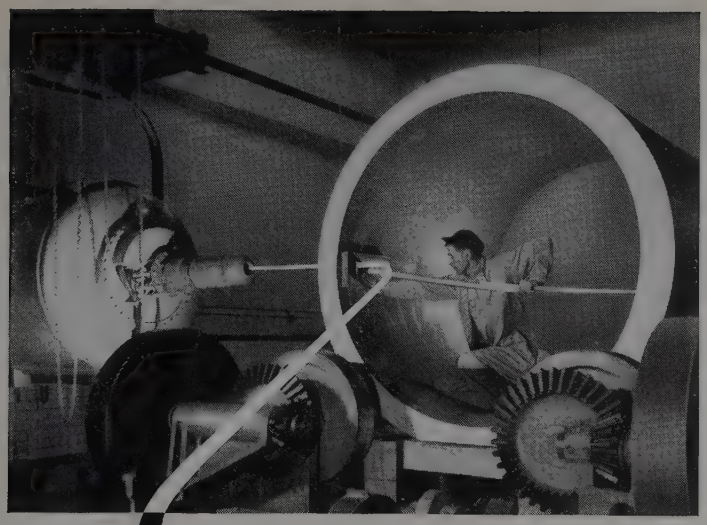

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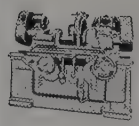

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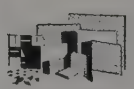

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MEN OF EXPECTATIONS . . .

(Continued from page 12)

In *technical* work the engineer solves technical problems under the general supervision of someone else who determines what problems are to be attacked and when a satisfactory solution has been obtained.

In *supervisory* work the engineer assigns problems to other engineers under his direction and supervises their work. He is usually responsible for the proper operation of a group or a department in an organization.

In *executive* work the engineer is concerned with the broader aspects of the operation of his company. This includes problems of general policy, organization and coordination, personnel, finance, law, and public relations. Many engineers hold important executive positions, this being particularly true in the engineering industries.

For the first few years after graduation the young engineer normally works on technical problems under the supervision of an experienced engineer. During this time he should be preparing himself, through study and observation, to assume direction of the efforts of others. This study should include such fields as human relations, management, labor relations, corporate finance, economics, and business law as well as subjects in his field of technical specialization. He should also begin to participate in the civic and sociological activities of his community so that the benefit of his training in handling problems will be available for the general welfare of all.

College Training of the Engineer

The prospective engineer should realize that the engineering college graduate is not a finished engineer. He does have, however, the foundation on which he can continue to build his career through experience and further study.

The foundation resulting from college training is so important in the development of the engineer that it must be as solid as possible. This requires an understanding and appreciation of the objectives of engineering college training. These objectives are to impart *knowledge,* to develop the *mental skills,* necessary to make use of the knowledge, and to develop the *attitudes and personal characteristics* which make it possible to get the greatest return from the application of the mental skills, in other words, to become a successful engineer and a good citizen.

The attainment of the foregoing objectives requires a carefully designed curriculum administered by good teachers.

An examination of the first two years shows that they are largely devoted to

(Continued on page 38)

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MEN OF EXPECTATIONS . . .

(Continued from page 36)

a study of fundamental laws and principles; development of the ability to find sources of information; and development, likewise, of facility in comprehension, expression, and visualization. Some factual information is, of course, accumulated and a start is made on the development of judgment and the ability to think straight.

Mathematics is a means of conveying ideas in symbolic form and is a tool needed in engineering calculations. Drawing is another important means of conveying ideas. Additional development in comprehension and expression and also development in the ability to find sources of information is given by the study of rhetoric and public speaking. The ability to write and speak clearly, concisely, and correctly is a necessity for the engineer, as he must convey information and ideas to others. Descriptive geometry has its greatest value for the prospective engineer in that it develops visualization, or the ability to set up mental pictures.

Further examination of the curriculum shows that the last two years are mainly devoted to technical courses. In these the student acquires a technical vocabulary and factual information in his field as well as further training in visualization and in analysis and synthesis. By contact with problems based on practical application he also begins to develop the judgment needed in his professional work.

It will be noted that the technical courses of the later semesters are usually arranged as options. This permits the student to work in the field of his special interest and reduces the general field sufficiently to permit a deeper and more detailed study than would be possible otherwise. This opportunity to work on more difficult problems results in a greater development and growth for the student along the lines of an engineering solution.

Much of the student's development in the ability to think straight, in the ability to analyze and synthesize, of confidence in his ability to learn, of honesty with facts and men, in the spirit of cooperation, in leadership, and in such characteristics as imagination, ingenuity, resourcefulness, industry, initiative, and self-reliance comes about more from the way a course is taught than from the material itself. This is true of the laboratory courses as well as for the theory courses. In the laboratory the development is accomplished by using experiments which are actually in the form of problems. With the problem type of experiment the responsibility for the determination of the data to be taken, the procedure to be followed, and the use to be made of the data is left mostly to the student.

In addition to the technical courses in the last four semesters, provision is made for the student to select a limited number of electives. Thus he has the opportunity to develop along cultural lines and in fields that will make him conscious of his broader responsibilities to his community and society in general. To utilize these electives most efficiently the student should select them to fit into an over-all general plan. Therefore during his second year he should gather as much inrfomation on this subject as possible and select the complete list to fit into an integrated whole. To aid the student in this selection the following reasons for the choice of an elective are given.

(1) Subject develops cultural and sociological background—are, literature, history, music, sociology, political science, classics, philosophy, languages, etc.

(2) Subject requires criticism of student's efforts — speech, business letter writing, report writing, dramatics, modern languages, etc.

(3) Subject requires specialized equipment or library facilities—bacteriology, astronomy, botany, zoology, archeology, etc.

(Continued on page 40)

In Hospitals—
Exterior and Air Conditioned Operating Rooms of Waynesboro (Penna.) Hospital. Quick-freezer Has 880 Cu. Ft.
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Refrigeration
Provides eight distinct services:
Air conditioning operating rooms
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Quick-freezing foods in bulk
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If your Hospital needs any of these refrigeration services, let us make recommendations.
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HERE is a man who can put your name in lights! In sign shops throughout the country he makes the neon signs that tell you where to buy the things you need or want. The low cost and colorful eye-appeal of these versatile signs give the smallest storekeeper the same display opportunities as his biggest competitors.

The letters that spell "drugs" or "groceries", "beer" or "ice cream", are shaped by skillful hands out of glass tubing made by Corning. The tubing is made from a special glass developed by Corning research, with many characteristics not found in ordinary glass. With the help of skilled operators, hundreds of miles of this tubing are drawn by automatic machine every day.

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Altogether, Corning makes over 37,000 glass products. Some day they may furnish just what you need to improve your product or make it more saleable. Remember us then. Corning Glass Works, Corning, N. Y.

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MEN OF EXPECTATIONS . . .

(Continued from page 38)

(4) Subject develops a hobby for recreation in professional life—geology, astronomy, music, botany, dramatics, etc.

(5) Subject is advantageous or adjunct in professional work—economics, business law, mathematics, industrial relations, accounting, etc.

It should be apparent that every course in the curriculum may contribute in some way or other to the attainment of each of the objectives of engineering college training. In the preceding discussion only the major contributions were pointed out.

The student should realize from the beginning that true education comes from the inside—that is, *the student educates himself*. It has been said that education consists of working *one's self* out of a state of mental confusion and that the complexity of the problem a student can solve is a measure of his capability. The curriculum, the University organization, and the instructors foster the student's growth in self-education by presenting the training material in properly graded steps and by helping the student acquire the techniques necessary in self-education. The student can contribute considerably to his growth by the way he studies. In this respect the word WHY is of the utmost importance. Studying with a questioning attitude, trying to determine the WHY for everything, rather than trying to remember only the end result, will help a great deal in the process of self-education.

In the complete educational program to develop an engineer it must be recognized that certain concepts are best taught in the university and that other ideas can be learned best by outside contacts, notably those in industry. For the closest integration between these two areas of learning, contact with industry should not be postponed until after graduation. Work in an industrial environment gives the student the opportunity to:

(1) Learn by experience how an industrial organization functions.

(2) Set up mental pictures of shops, apparatus, and devices which will be valuable in later college study.

(3) Secure experience and information which will be helpful in the selection of an option and of the type of industry to work in after graduation.

(4) Observe and obtain knowledge of labor relations through actual work with the men who produce. (This association can be more intimate at this time than after graduation, when the student becomes a member of an engineering department which is usually associated more with planning than production.

The student will receive less guidance in industry than in the university. Consequently, the value derived from the summer work in industry will depend largely upon the student himself.

Although not often mentioned, a good personality is also an important factor in the attainment of success in engineering just as it is in nearly all other walks of life. When several men of equal abilities are being considered for promotion, the man with the better personality will nearly always be selected. Conversely, numerous cases exist where an otherwise well qualified man is not promoted because of a poor personality. Thus the student should give considerable attention to developing his personality, to the end that he will become possessed of good personal and social traits. Just as in the development of mental skills, development of a pleasing personality requires initiative and earnest effort. The student will find that improvement in his personality can be accomplished better by association with his fellow men than by formal education. He should take advantage of opportunities to de-

(Continued on page 42)

Leather can "take"
Leather has a natural, cushioning resiliency that enables it to withstand and absorb shocks.
On the gridiron, leather "takes" the fullback's punishing kick. In today's industry, leather belting absorbs power shocks between motor and driven machine.
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He's a Square D Field Engineer... his full-time job is working with industries of every kind and size in finding "a better way to do it." He talks less about theory, more about proven practice. He has a tremendous amount of actual experience to back him up.

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MEN OF EXPECTATIONS . . .

(Continued from page 40)

velop himself socially by attending parties, group meetings, church activities, banquets, dances, and other social functions.

One of the definitions of the word "tool" given by Webster is "anything that serves as a means to an end."

Every profession has certain necessary tools which an individual must expect to acquire as a part of his investment in his future success. The following items are essential to the engineer. They are mentioned here because they should be purchased early in his collge career so that, by repeated use, he will feel thoroughly at home with them:

(1) Drawing instruments—for clarity in the graphical presentation of ideas.

(2) Typewriter—for clarity in the written presentation of ideas.

(3) Slide rule—for speed and reasonable accuracy in computations.

(4) Tuxedo—for freedom and ease in associations with people on formal occasions.

An adequate library is also an important tool of the engineer. The collection of such a library, containing not only required texts, but also important reference works and technical periodicals, requires time and money, and should be started as early as possible.

SIGMA PHI DELTA . . .

(Continued from page 9)

are red and black, and the official flower of the fraternity is the American Beauty rose. The pledge button has a red triangular background on which is a black castle, the whole bordered in gold. The active pin is triangular in shape and upon the face are three raised arms bearing the characters of the fraternity name. In the center of the pin shines a ruby. A star in each of the three apexes of the triangle completes the pin.

Delta chapter of Sigma Phi Delta is located at 1103 West Illinois street, Urbana, Illinois. President of this fraternity, strictly for engineers, is Robert S. Degenkolb, a student in ceramic engineering. Members of Sigma Phi Delta may be found in almost all branches of engineering, including chemical and architectural engineering. Likewise, members of this fraternity may be found in most of the engineering activities, including the Engineering council, The Technograph, Sigma Xi, and other engineering societies and honoraries.

Dual membership is not permitted members of Sigma Phi Delta. The founders of this fraternity combined the functions of all three types of fraternities—honarary, professional, and social, into one fraternity. Delta chapter justifies the faith of the charter members by retaining a high position on the all-fraternity scholarship roster each semester. The last two semesters, the fraternity has held a high second place. The social life of the engineering student is limited by the amount of time he has to devote to his laboratories and studies. Therefore, a social program which tends to provide a well-rounded individual, but which does not occupy too much time, is the aim of the chapter. Sigma Phi Delta is a member of the Interfraternity council and the Professional Interfraternity conference. Twenty-eight members of Sigma Phi Delta live in the chapter house and 12 members elsewhere on the campus. The fraternity participates in the intramural activities sponsored by the I. F. council and supports all the other activities and plans of the council.

Faculty members of Sigma Phi Delta fraternity are Professors Babbitt, Crandell, Knight, Straub, Tuthill, and Wiley. There are also some alumni in teaching and research positions on the faculty. Delta alumni of Sigma Phi Delta have been very active and cooperative in the support of the active chapter. The alumni chapter continues the ties of brotherhood after the members graduate and leave the campus. There are approximately 1,800 alumni members of Sigma Phi Delta throughout the engineering profession.

"I'm anxious to make this a good shot. That's my mother-in-law watching up on the club house porch."

"Don't be a fool. You'll never hit her at 200 yards."

* * *

Author: "I have just written my first novel. There isn't an immoral line in it."

Critic: "That's not a novel; that's a textbook."

* * *

Jones: "His father died from hard drink."

Bones: "He did?"

Jones: "Yes, a cake of ice fell on him."

* * *

Old Lady: "I wouldn't cry like that, my little man."

Boy: "Cry as you damn please, this is my way."

* * *

"I can't marry him, mother, he's an atheist and doesn't believe there is a hell."

"Marry him, my dear, and between us we'll convince him that he's wrong."

Merry Christmas, Engineers

For that last-minute gift shopping we have lots of answers

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THE BEST in BOOKS
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FOUNTAIN PENS
NEW WORLD GLOBES

We are still able to offer you a wide selection of Christmas cards with 24-hour personalizing service.

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One result of this experimentation has been a flexibility that permits stepped-up output of whichever petroleum products are most urgently required. When the primary need was for vast quantities of aviation gasoline to help win the war, research showed how it could be produced. In a peace-time summer, the great demand is for an ocean of automobile gasoline; in winter, less gasoline and more fuel oil are needed. Research tells the industry how to make petroleum serve the public more efficiently.

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SOCIETIES . . .

(Continued from page 17)

I.T.E.

Tweet! Pull over to the curb, Bub! Thus the local student branch of the Institute of traffic engineers is off to a big start again this year. Their first meeting, held on September 24, was merely an introductory meeting to get the new students and prospective members acquainted with the group.

Only five former members yet remain in the I.T.E. The enrollment now stands at 17, with hopes of reaching the 25 mark in the next few meetings.

This organization, devoted to the studies of traffic problems in the Twin-Cities area, has offered many recommendations in their short existence. Some of these recommendations have been used and have produced remarkable results.

The second meeting of the I.T.E. was held on October 5. At this time a problem program for the following semester was outlined. It was decided to investigate: (1) parking problems on the University of Illinois campus, and (2) Temporary traffic problems due to the large amount of construction about the campus. It was also decided to make follow-up reports on last year's recommendations to see what improvements, if any, were brought about by them.

The last meeting, held on October 19, was devoted to talks by Prof. C. C. Wiley, and Prof. Ellis Danner on the problem program for the coming semester.

TAU BETA PI

With the fall semester well under way, the various committees of Tau Beta Pi are hard at work ironing out the details of the election, examination, and initiation of new pledges.

The new chapter officers have been elected for the spring term. Robert Carlson was elected to fill the office of president, and James Crawford was elected to the post of vice-president.

Charles E. Drury, chapter president, attended the national convention of Tau Beta Pi held at the University of Texas, Austin, Texas, from October 14 to 16 inclusive. While at the convention, Drury came in contact with many prominent alumni of the University of Illinois. Among them was Robert C. (Red) Matthews. Matthews was introduced between halves of the Arkansas-Texas football game as the father of organized cheer-leading. Matthews became a member of Illinois Alpha of Tau Beta Pi in 1902. At the present time he is a member of the faculty of the University of Tennessee.

A.I.E.E.-I.R.E.

About 115 members of the A.I.E.E.-I.R.E.E. went on a field trip recently to Springfield to visit the Sangamo Electric plant. These field trips are an important part of the extensive program of the electrical and radio engineering societies; two will take place each semester.

The organization's over 500 members will be able to keep up to date now by reading the A.I.E.E.-I.R.E.'s newsletter, "What-Meter." The meeting of November 9 included a lecture given by a member of the University's electrical engineering research laboratory staff. C. N. Hoyler of the R. C. A. research laboratory at Princeton, N. J., spoke on Electronic Computers and Counters" at the meeting of November 19.

The A.I.E.E.-I.R.E. also has its fair share of brains. Ed Schwartz, its secretary, has received the Eta Kappa Nu outstanding junior award. Congratulations, Ed!

M. E.: "Resist the temptation."
E. E.: "Would, but it may never come again."

When FASTENING becomes your responsibility, remember this important fact — — —

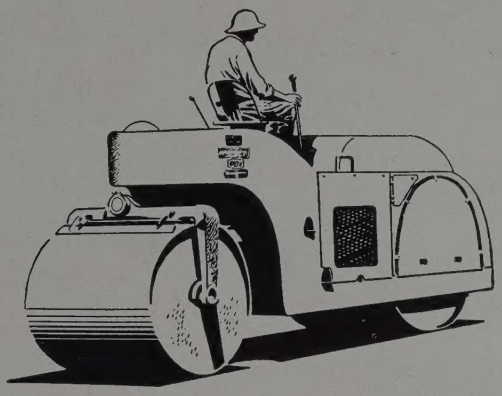
It costs more to specify, purchase, stock, inspect, requisition and *use* fasteners than it does to buy them. *True Fastener Economy* means making sure that *every* function involved in the *use* of bolts, nuts, screws, rivets and other fasteners contributes to the desired fastening result — maximum holding power at the lowest possible *total* cost for fastening.

You Get True Fastener Economy When You Cut Costs These Ways

1. Reduce assembly time with accurate, uniform fasteners
2. Make satisfied workers by making assembly work easier
3. Save receiving inspection through supplier's quality control
4. Design assemblies for fewer, stronger fasteners
5. Purchase maximum holding power per dollar of initial cost
6. Lower inventory by standardizing types and sizes of fasteners
7. Simplify purchasing by using one supplier's complete line
8. Improve your product with a quality fastener.

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY
Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif.

Another page for **YOUR BEARING NOTEBOOK**



How to keep a tandem roller from doing the shimmy

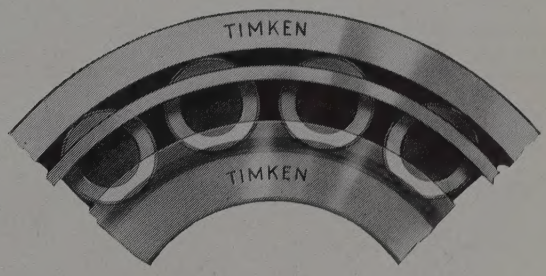
The king pin bearings on tandem road rollers like this take heavy thrust and radial loads. If wear and looseness develop, shimmy is the result. Here's another example of a difficult problem that engineers solve by using Timken tapered roller bearings.

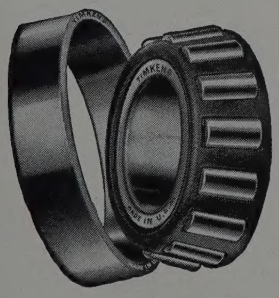
Timken bearings take both thrust and radial loads in any combination. Their true rolling motion means smooth, almost frictionless operation with negligible wear. Easy, accurate steering and freedom from shimmy are assured, even after years of hard service. The need for frequent lubrication is eliminated and maintenance is reduced to a minimum.

Here's why Timken® rollers stay in positive alignment

Accurate and constant roller alignment in Timken tapered roller bearings is assured by their design. Wide area contact between the roll ends and the rib of the cone keeps the rollers stable. It prevents skewing, eliminates the need for alignment by the cage, and increases load capacity.

The Timken Roller Bearing Company developed the principle of positive roller alignment—one more reason why Timken bearings are the number one choice of engineers everywhere.





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TAPERED ROLLER BEARINGS

Want to know more about bearings?

Some of the important engineering problems you'll face after graduation will involve bearing applications. If you'd like to learn more about this phase of engineering, we'd be glad to help. For additional information about Timken bearings and how engineers use them, write today to The Timken Roller Bearing Company, Canton 6, Ohio. And don't forget to clip this page for future reference.

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⊕ AND THRUST →⊕← LOADS OR ANY COMBINATION ✳

An Engineer Goes Through Hell!

Three men—a lawyer, a doctor, and an engineer—appeared before St. Peter as he stood guarding the pearly gates.

The lawyer stepped forward—with confidence and assurance he proceeded to deliver an eloquent address which left St. Peter dazed and bewildered. Before the venerable Saint could recover, the lawyer quickly handed him a writ of mandamus, pushed him aside and strode through the open portals.

Next came the doctor. With impressive, dignified bearing, he introduced himself: "I am Dr. Brown." St. Peter received him cordially. "I feel I know you, Dr. Brown. Many who preceded you said you sent them here before their time. Welcome to our city!"

The engineer, modest and diffident, had been standing in the background. He now stepped forward. "I am looking for a job," he said. St. Peter wearily shook his head. "I am sorry," he replied, "we have no work here for you. If you want a job you can go to Hell."

This response sounded familiar to the engineer and made him feel at home. "Very well," he said, "I have had hell all my life and I guess I can stand it better than the others."

St. Peter was puzzled. "Look here, young man, what are you?" "I am an engineer," was the reply. "Oh, yes," said St. Peter. "Do you belong to the Locomotive Brotherhood?" "No, I am sorry," the engineer responded apologetically, "I am a different kind of engineer." "I do not understand," said St. Peter, "what on earth do you do?"

The engineer recalled a definition and calmly replied: "I apply mathematical principles to the control of natural forces." This sounded meaningless to St. Peter and his temper got the best of him. "Young man," he said, "you can go to Hell with your mathematical principles and try your hand on some of the natural forces there!"

And it came to pass that strange reports began to reach St. Peter. The celestial denizens, who had amused themselves in the past by looking down upon the less fortunate creatures in the Inferno, commenced asking for transfers to that other domain.

The sounds of agony and suffering were stilled. Many new arrivals, after seeing both places, selected the nether regions for their permanent abode. Puzzled, St. Peter sent messengers to visit Hell and report back to him. They returned, all excited, and reported to St. Peter:

"That engineer you sent down there," said the messengers, "has completely transformed the place so that you would not know it now. He has harnessed the fiery furnaces for light and power. He has cooled the entire place with artificial refrigeration."

"He has drained the lakes of brimstone and has filled the air with cool perfumed breezes. He has flung bridges across the bottomless abyss and has bored tunnels through obsidian cliffs. He has created paved streets, gardens, parks and playgrounds, lakes, rivers and beautiful waterfalls.

"That engineer has gone through Hell and has made of it a realm of happiness, peace and industry."

—Reprinted from News Letter of Association of Professional Engineers of the Province of Ontario, Canada.

Liquor Salesman: "Y'know, I hate to to see a woman drink alone."

Food Salesman: "I hate to see a woman eat alone."

Mattress Salesman: "Say, what do you fellows think of the cold weather we've been having?"

* * *

A faith healer ran into his old friend Max and asked how things were going.

"Not so good," was the pained reply. "My brother is very sick."

"Your brother isn't sick," contradicted the faith healer, "he only thinks he's sick. Remember that: he only *thinks* he's sick."

Two months later they met again and the faith healer asked Max, "How's you brother now?"

"Worse," groaned Max, "he *think's* he's dead."

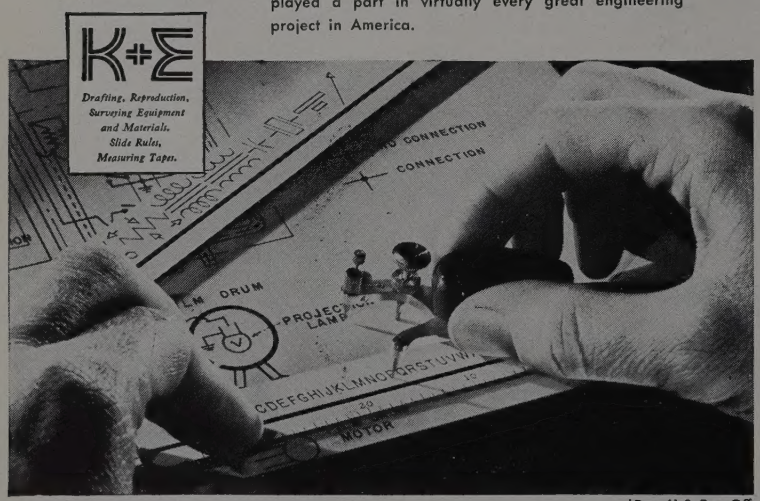
* * *

A girl who worked as a hostess in Roseland was complaining to her friend, also a hostess, that she was never invited out to swell parties. "I get invited once—but that's all." Her friend took her aside and said, "The reason that you're never invited again is that you can't discuss any subject with people. Read a book and you'll become an interesting conversationalist." So the social climber read a book.

When she was invited to a party a few days later, she was all prepared. She listened to the conversation for a while and then cut in, "Say, wasn't that tough about Marie Antoinette?"

partners in creating

For 81 years, leaders of the engineering profession have made K & E products their partners in creating the technical achievements of our age. K & E instruments, drafting equipment and materials—such as the LEROY† Lettering equipment in the picture—have thus played a part in virtually every great engineering project in America.



†Reg. U.S. Pat. Off.

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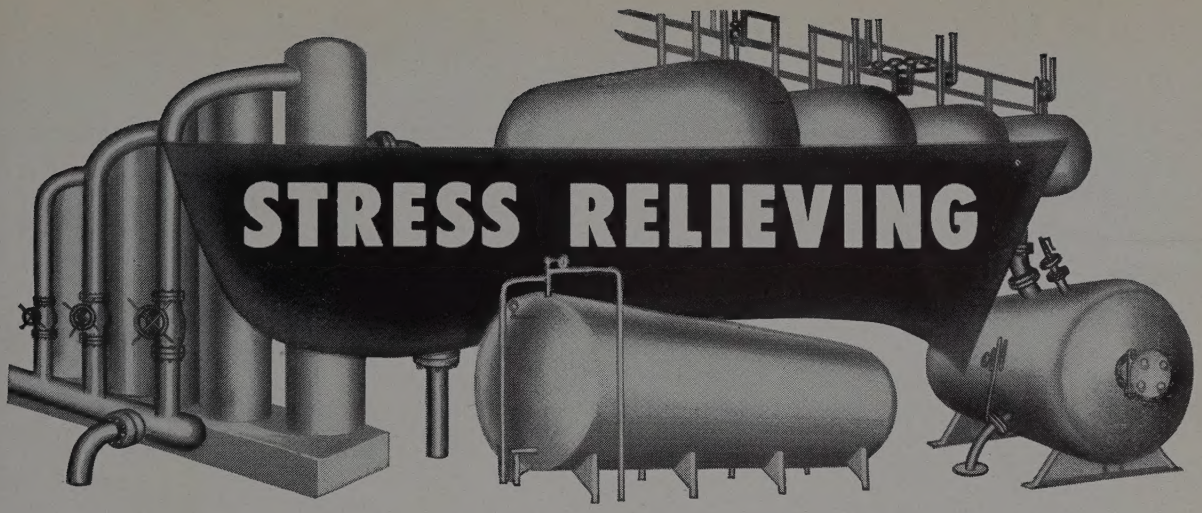


Temperature Ranges Required for Pressure Vessels at BLACK, SIVALLS & BRYSON, Inc. Demonstrate Controllability of *GAS*

Safety codes govern many of the manufacturing and testing methods for pressure vessels. One of the most important processes, stress relieving, requires precise control of temperatures throughout the cycle—just the type of temperature control to be found in thousands of industrial applications of GAS for heat treating.

Specialists in the manufacture of pressure vessels depend on GAS for heat processing of all types. The pioneering firm of Black, Sivalls and Bryson, Inc., Kansas City, uses GAS in the manufacture of tanks, valves, pressure vessels and safety heads. President A. J. Smith says,

"Throughout the past 25 years we have depended on GAS to provide the exacting temperatures for our work. In many of our plants we have developed special GAS equipment; our large stress-relieving furnace at Oklahoma City is a typical example."

In this large furnace the GAS control system is arranged to provide temperatures up to 1200° F. for any time-cycle required. Automatic regulators and recording pyrometers assure maximum fuel efficiency while the flexibility of GAS is an important factor in maintaining production schedules on vital equipment.

Stress-relieving is just one of the applications of GAS for heat processing. You'll find hundreds of other uses for the productive flames of GAS—they're worth investigating.

MORE AND MORE...

THE TREND IS TO *GAS*

FOR ALL INDUSTRIAL HEATING

One of the largest stress-relieving ovens in the United States, this installation at Oklahoma City is 77' long, 12' wide, 18' high—Gas-fired and equipped with recording pyrometers.

AMERICAN GAS ASSOCIATION

420 LEXINGTON AVENUE NEW YORK 17, N. Y.

"Mister, if you think you can kiss me like that again, I'll have something to say about it."

"Well, I'm going to, so start talking."

"The light switch is right next to the piano."

* * *

The Human Race—the only race which is never over and which no one ever won. Each succeeding generation is a new relay. They travel 'round nature's course neck and neck and usually end up tied!

* * *

When you knock at the door and find hubby home, then, brother, sell something.

* * *

The Old Maid: "Has the canary had its bath yet?"

The Maid: "Yes, he has, ma'm. You can come in now."

* * *

Student: "I could dance on like this forever."

Coed: "Oh, don't say that. You're bound to improve."

* * *

"Don't talk to me about lawyers, my dear. I've had so much trouble over the property that I sometimes wish my husband hadn't died."

* * *

Bill: "The girl I am married to has a twin sister."

Mac: "Gee! How do you tell them apart?"

Bill: "I don't try. It's up to the other one to look out for herself."

* * *

"I hear he was a big gun in college."

"That so? What kind?"

"A sort of smooth bore."

* * *

Then there's the bachelor who got thrown out of his apartment when the landlady heard him drop his shoes on the floor twice.

Zoo Visitor: "Where are the monkeys?"

Keeper: "They're in the back, making love."

Visitor: "Would they come out for some peanuts?"

Keeper: "Would you?"

ANNOUNCING — a new department—"Letters to Ye Ed," in which you will have the opportunity to express your ideas on any thing that interests you: pet peeves, campus activities, suggestions, etc.

Letters should be addressed to The Illinois Technograph, 213 Engineering Hall, University of Illinois, Urbana, Illinois. Length of the letters should not exceed 300 words, and they must be signed by the sender. Names will be withheld upon request.

A wealthy dowager invited about 50 soldiers from a near-by camp to her home. At about 4 o'clock, she served cookies and lemonade. At about 5 she served more cookies and lemonade. At about 6, she stood up and said, "I have just four more cookies left—now what shall I do with them?"

Immediately a lieutenant stood up and said, "The first guy who answers gets the guardhouse for a week."

* * *

Ed Gardner's friend, Finnegan, was down at Duffy's Tavern enjoying a glass of beer. "How many barrels of beer do you use a day?" he asked the proprietor.

"Four," said the barkeep. "Why do you ask?"

"Cause I can tell you how you could use eight barrels a day."

"You can?" came the delighted response. "How can I?"

"Give full glasses," Finnegan retorted bitterly.

* * *

Mother: "What took you so long to say goodnight to that fellow?"

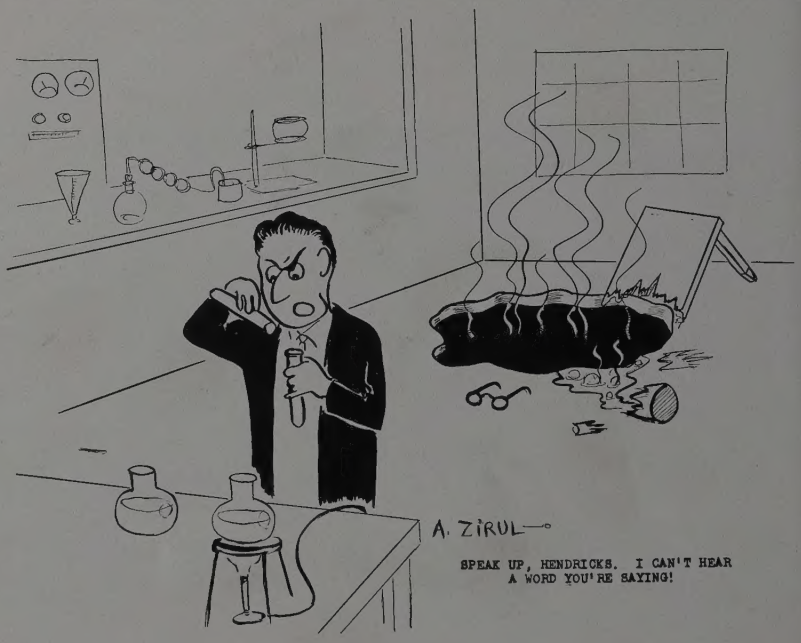
Daughter: "But, mother, if a boy takes you to a movie, the least you can do is to kiss him goodnight."

Mother: "But, I thought you went to El Morocco."

Daughter: "Yes, mother."

* * *

In the old days, when a fellow told a girl a naughty story, she blushed. Nowadays, she memorizes it.

* * *

Then there was a girl named "Checkers" because she jumped whenever you made a wrong move.